This document provides pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a Minor, Municipal permit. The discharge results from the operation of a 0.0375 MGD wastewater treatment plant. Future expanded flows of 0.125 MGD and 0.210 MGD are included with this reissuance. This permit action consists of updating the proposed effluent limits to reflect the current Virginia WQS, effective 6 January 2011, and updating permit language, as applicable. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9VAC25-260-00 et seq.

1.	Facility Name and Mailing Address:	Four Winds Campground STP P.O. Box 7 Rappahannock Academy, VA 22538	SIC Code:	4952 WWTP
	Facility Location:	Route 17 South, end of State Route 615	County:	Caroline
	Facility Contact Name:	Mr. Wayne Roberts	Telephone Number:	804-742-5739
2.	Permit No.:	VA0060429	Expiration Date:	12 March 2011
	Other VPDES Permits:	VAN020113		
	Other Permits:	PWSID 6033249 & 6033250 – public water supply		
	E2/E3/E4 Status:	Not Applicable		
3.	Owner Name:	The Four Winds Club, Incorporated		
	Owner Contact / Title:	Mr. Wayne Roberts / General Manager	Telephone Number:	804-742-5739
4.	Application Complete Date:	26 January 2011		
	Permit Drafted By:	Douglas Frasier	Date Drafted:	9 March 2011
	Draft Permit Reviewed By:	Alison Thompson	Date Reviewed:	18 March 2011
		Bryant Thomas	Date Reviewed:	4 April 2011
	Public Comment Period:	Start Date: 27 May 2011	End Date:	27 June 2011
5.	Receiving Waters Information:	See **Attachment 1** for the Flow Frequency Determination.		
	Receiving Stream Name:	Rappahannock River	Stream Code:	3-RPP
	Drainage Area at Outfall:	1,735 square miles*	River Mile:	93.52
	Stream Basin:	Rappahannock River	Subbasin:	None
	Section:	01	Stream Class:	II
	Special Standards:	a	Waterbody ID:	VAN-E21E
	7Q10 Low Flow:	Tidal	7Q10 High Flow:	Tidal
	1Q10 Low Flow:	Tidal	1Q10 High Flow:	Tidal
	Harmonic Mean Flow:	Tidal	30Q5 Flow:	Tidal
	303(d) Listed:	Yes	30Q10 Flow:	Tidal
	TMDL Approved:	Yes	Date TMDL Approved:	5 May 2008

*Updated from planning memo.

6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

- ✓ State Water Control Law
- ✓ Clean Water Act
- ✓ VPDES Permit Regulation
- ✓ EPA NPDES Regulation
- ___ EPA Guidelines
- ✓ Water Quality Standards
- ✓ Other: 9VAC25-280-10 et seq. Groundwater Quality Standards

  9VAC25-820-10 et seq. General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia

7. **Licensed Operator Requirements:** Class III

8. **Reliability Class:** Class I

9. **Permit Characterization:**

✓ Private	✓ Effluent Limited	___ Possible Interstate Effect
___ Federal	✓ Water Quality Limited	___ Compliance Schedule Required
___ State	___ Toxics Monitoring Program Required	___ Interim Limits in Permit
___ POTW	___ Pretreatment Program Required	___ Interim Limits in Other Document
✓ TMDL		

10. **Wastewater Sources and Treatment Description:**

Influent from the campground and golf course clubhouse passes through a bar screen prior to a lined stabilization lagoon. It should be noted that there is a second unlined lagoon at this facility which is not utilized. This lagoon would require a liner if it were put into service. Wastewater is pumped from the lagoon through a nitrification process unit (GEO – Reactor). The effluent from this process unit can either be pumped to the 28,000 gallon clarifier tank during a discharge or recirculated back to the lagoon when the facility is not discharging. The final effluent is chlorinated and dechlorinated via tablet feeders, reaerated via a step aeration channel and then piped by gravity approximately 800 yards to the Rappahannock River.

See **Attachment 2** for a facility schematic/diagram.

TABLE 1
OUTFALL DESCRIPTION

Number	Discharge Sources	Treatment	Design Flow	Latitude / Longitude
001	Domestic Wastewater	See Item 10 above.	0.0375 MGD	38° 14' 54" / 77° 15' 56"
See **Attachment 3** for the Rappahannock Academy topographic map.				

11. **Sludge Treatment and Disposal Methods:**

All sludge/solids produced during normal operation of this lagoon system remain within the system. Essentially, there is no further treatment of the sludge other than the natural breakdown of the material within the lagoon.

12. **Discharges and Monitoring Stations Located within the Waterbody VAN-E21E:**

TABLE 2
DISCHARGES & MONITORING STATIONS

ID / Permit Number	Facility Name	Type	Receiving Stream
VA0089338	Hopyard Farm Wastewater Treatment Facility	Municipal	Rappahannock River
VA0090654	Greenhost Incorporated	Industrial	Birchwood Run, UT
VAG406465	Hurdle David Residence	Single Family Home	Keys Run
3-RPP0091.55	DEQ Monitoring Station		Rappahannock River

13. Material Storage:

TABLE 3 MATERIAL STORAGE		
Materials Description	Volume Stored	Spill/Stormwater Prevention Measures
Hypochlorite	One 5 gallon bucket	Stored under roof
Sodium Sulfite	One 5 gallon bucket	

14. Site Inspection: Performed by Beth Biller – DEQ Compliance on 15 September 2008. See **Attachment 4** for the technical inspection summary.

15. Receiving Stream Water Quality and Water Quality Standards:

a. Ambient Water Quality Data

Outfall 001 discharges into the tidal freshwater Rappahannock River. DEQ monitoring station 3-RPP0091.55 is located 1.9 miles downstream of the outfall. Monitoring results have revealed impairments for the Rappahannock River.

Impairments due to bacteria led to the development of the Tidal Freshwater Rappahannock River Bacteria Total Maximum Daily Load (TMDL). This TMDL was subsequently approved by the Environmental Protection Agency (EPA) on 5 May 2008. This facility has a Wasteload Allocation (WLA) of 3.65E+11 cfu/year for *E. coli* bacteria.

In addition, the Rappahannock River has been listed as impaired for Fish Consumption Use due to Polychlorinated Biphenyls (PCBs) found in fish tissue samples. This TMDL is due in 2016. Staff has concluded that low-level PCB monitoring is not warranted for this facility since there are not and have not been any industrial activity or users at this facility. However, if the facility is expanded, it may be requested to monitor for this pollutant as set forth under the aforementioned TMDL.

The Wildlife Use is considered fully supporting.

Significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal and the 2010 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that much of the mainstem Bay does not fully support this use support goal under Virginia's Water Quality Assessment guidelines. Nutrient enrichment is cited as one of the primary causes of impairment.

In response, the Virginia General Assembly amended the State Water Control Law in 2005 to include the *Chesapeake Bay Watershed Nutrient Credit Exchange Program.* This statute set forth total nitrogen and total phosphorus discharge restrictions within the bay watershed. Concurrently, the State Water Control Board adopted new water quality criteria for the Chesapeake Bay and its tidal tributaries. These actions necessitate the evaluation and the inclusion of nitrogen and phosphorus limits on discharges within the bay watershed.

b. Receiving Stream Water Quality Criteria

Part IX of 9VAC25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream, Rappahannock River, is located within Section 01 of the Rappahannock River Basin and is designated as Class II water.

Class II tidal waters in the Chesapeake Bay and the tidal tributaries must meet dissolved oxygen concentrations as specified in 9VAC25-260-185 and maintain a pH of 6.0 – 9.0 standard units as specified in 9VAC25-260-50. In the Northern Virginia area, Class II waters must meet the Migratory Fish Spawning and Nursery Designated Use from February 1 through May 31. For the remainder of the year, these tidal waters must meet the Open Water use. The applicable dissolved oxygen concentrations are presented **Attachment 5**.

Attachment 6 details other water quality criteria applicable to the receiving stream. It is staff's best professional judgement that a value of 0 g/kg be utilized for salinity since this facility discharges into the freshwater portion of the Rappahannock River.

Ammonia:

Staff utilized April 2000 – October 2007 receiving stream ambient monitoring data from station 3-RPP0091.55 and the May 2007 to January 2011 effluent data for pH and temperature values to establish ammonia criteria and subsequent effluent limits. These data sets may be found in the reissuance file. Since there is no effluent temperature data, staff used a default value of 25° C and an assumed 15° C for temperature in order to calculate summer and winter ammonia criteria, respectively.

The calculated criteria are shown in **Attachment 6**.

Metals Criteria:

The Water Quality Criteria for some metals are dependent on the receiving stream's hardness (expressed as mg/L calcium carbonate). The average hardness of the receiving stream is 29.2 mg/L $CaCO_3$ per the aforementioned data set for monitoring station 3-RPP0091.55, located in the reissuance file. There is no hardness data for this facility; therefore, staff guidance suggests using a default hardness value of 50 mg/L $CaCO_3$.

The hardness-dependent metals criteria shown in **Attachment 6** are based on this value.

Bacteria Criteria:

The Virginia Water Quality Standards (9VAC25-260-170.A.) establishes the following criteria to protect primary contact recreational uses:

E. coli bacteria per 100 mL of water shall not exceed the following:

	Monthly Geometric Mean[1]
Freshwater *E. coli* (N/100 mL)	126

[1] Four or more samples taken during any calendar month

c. Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9VAC25-260-360, 370 and 380) designates the river basins, sections, classes and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, Rappahannock River, is located within Section 01 of the Rappahannock River Basin. This section has been designated with a special standard of ?a?.

The receiving stream has been designated with a special standard of ?a?. According to 9VAC25-260-310.a, Special Standard ?a? applies to all open ocean or estuarine waters capable of propagating shellfish or in specific areas where public or leased private shellfish beds are present, including those waters on which condemnation or restriction classifications are established by the State Department of Health. The fecal coliform bacteria standard is as follows: the geometric mean fecal coliform value for a sampling station shall not exceed an MPN (Most Probable Number) of 14 per 100 milliliters of sample and the 90^{th} percentile shall not exceed 43 for a 5-tube, 3-dilution or 49 for a 3-tube, 3-dilution test. The shellfish are not to be so contaminated by radionuclides, pesticides, herbicides or fecal material that the consumption of shellfish might be hazardous. This same standard is also contained in 9VAC25-260-160 Fecal Coliform Bacteria; Shellfish Waters. This standard is used for the interpretation of instream monitoring data and not for setting fecal coliform effluent limitations.

On 15 January 2003, new bacteria standards in the Water Quality Standards (9VAC25-260-170.A.) became effective as did a revised disinfection policy, 9VAC25-260-170.B. These standards replaced the fecal coliform standard; thus, *E. coli* and enterococci bacteria became the criterion. It has been demonstrated that the limit for *E. coli* of 126 N/100 mL, which is applicable for Freshwater Water, is protective and will be carried forward with this reissuance.

d. Virginia Institute of Marine Science (VIMS) Model

Stafford County, Spotsylvania County and the City of Fredericksburg sponsored a water quality model for the upper Rappahannock River estuary developed by the Virginia Institute for Marine Science, entitled A Modeling Study of the Water Quality of the Upper Rappahannock River (VIMS model). This model was approved by the State Water Control Board Director on 6 December 1991 and has been used to determine effluent limitations for new and expanded discharges in the upper Rappahannock River. Staff last ran the VIMS model in December 2009 in support of the VPDES permit modification for the Massaponax WWTP. A summary of the December 2009 VIMS model is found in **Attachment 7**.

e. Threatened or Endangered Species

The Virginia DGIF Fish and Wildlife Information System Database was searched on 3 February 2011 for records to determine if there are threatened or endangered species in the vicinity of the discharge. The following threatened species were identified within a 2 mile radius of the discharge: Upland Sandpiper (song bird); Loggerhead Shrike (song bird); Bald Eagle; and Migrant Loggerhead Shrike (song bird). The limits proposed in this draft permit are protective of the Virginia Water Quality Standards and therefore, protect the threatened species found near the discharge.

The stream that the facility discharges to is within a reach identified as having an Anadromous Fish Use. It is staff's best professional judgment that the proposed limits are protective of this use.

16. Antidegradation (9VAC25-260-30):

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream has been classified as Tier 2 in previous reissuances of this permit. A review of the ambient monitoring data indicates that the Virginia Water Quality Standards are met or exceeded; thus, providing no basis to change the classification. Therefore the Tier 2 classification will remain. No significant degradation to the existing water quality will be allowed. In accordance with current DEQ guidance, no significant lowering of water quality is to occur where permit limits are based on the following:

- The dissolved oxygen in the receiving stream is not lowered more than 0.2 mg/L from the existing levels;
- The pH of the receiving stream is maintained within the range 6.0 – 9.0 S.U.;
- There is compliance with all temperature criteria applicable to the receiving stream;
- No more than 25% of the unused assimilative capacity is allocated for toxic criteria established for the protection of aquatic life; and
- No more than 10% of the unused assimilative capacity is allocated for criteria for the protection of human health.

The antidegradation policy also prohibits the expansion of mixing zones to Tier 2 waters unless the requirements of 9VAC25-260-30.A.2 are met. The draft permit is not proposing an expansion of the existing mixing zone.

17. Effluent Screening, Wasteload Allocation, and Effluent Limitation Development:

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points are equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards (WQS) are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLAs) are calculated. The WLAs values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. Effluent limitations are the calculated on the most limiting WLA, the required sampling frequency and statistical characteristics of the effluent data.

a. Mixing Zones and Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated for those parameters in the effluent with the reasonable potential to cause an exceedance of water quality criteria. The basic calculation for establishing a WLA is the steady state complete mix equation:

$$WLA = \frac{C_o [Q_e + (f) (Q_s)] - [(C_s) (f) (Q_s)]}{Q_e}$$

Where:
- WLA = Wasteload allocation
- C_o = In-stream water quality criteria
- Q_e = Design flow
- Q_s = Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; harmonic mean for carcinogen-human health criteria; 30Q10 for ammonia criteria; and 30Q5 for non-carcinogen human health criteria)
- f = Decimal fraction of critical flow
- C_s = Mean background concentration of parameter in the receiving stream.

The water segment receiving the discharge via Outfall 001 is considered tidal; hence, flow frequencies cannot be calculated for the 7Q10, 1Q10 and 30Q10 critical conditions. As such, utilization of default values of 50:1 for chronic and 2:1 for acute toxicity is recommended in lieu of the mixing zone standard.

Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent (e.g., total residual chlorine where chlorine is used as a means of disinfection) and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, ammonia as N is likely present since this is a WWTP treating sewage and total residual chlorine may be present since chlorine is used for disinfection.

Antidegradation Wasteload Allocations (AWLAs)

Since the receiving stream has been determined to be Tier II water, staff must also determine antidegradation wasteload allocations (AWLAs). The steady state complete mix equation is used substituting the antidegradation baseline (C_b) for the in-stream water quality criteria (C_o):

$$AWLA = \frac{C_b (Q_e + Q_s) - (C_s) (Q_s)}{Q_e}$$

Where:
- AWLA = Antidegradation-based wasteload allocation
- C_b = In-stream antidegradation baseline concentration
- Q_e = Design flow
- Q_s = Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; harmonic mean for carcinogen-human health criteria; 30Q10 for ammonia criteria; and 30Q5 for non-carcinogen human health criteria)
- C_s = Mean background concentration of parameter in the receiving stream.

Calculated AWLAs for the pollutants noted in 17.a. above are presented in **Attachment 6**.

b. Effluent Limitations, Outfall 001 – Toxic Pollutants

9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with AWLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9VAC25-31-230.D. requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1). Ammonia as N:

As noted earlier, staff calculated the AWLAs utilizing available data and default values. These allocations were then multiplied by the respective dilution factors of 2 for acute and 50 for chronic. DEQ guidance suggests using a sole data point of 9.0 mg/L to ensure the evaluation adequately addresses the potential for ammonia to be present in the discharge containing domestic sewage.

0.0375 MGD

At this flow tier, the discharge is considered intermittent; thus, only the acute criterion was used to ascertain the ammonia limits. This resulted in calculated summer and winter limitations of 4.3 mg/L and 9.1 mg/L as monthly and weekly averages, respectively. Due to antibacksliding provisions , the existing ammonia limitation of 4.2 mg/L as a monthly average for summer (May – October) and the current limit of 6.3 mg/L for winter (November – April) will be carried forward with this reissuance.

0.125 MGD and 0.210 MGD

The calculated summer (May – October) limitations were 2.3 mg/L monthly average and 3.1 mg/L for the weekly average; the same as the current limitations. Therefore, the current ammonia limitations for the months May – October will remain unchanged with this reissuance.

The calculated winter (November – April) limitations were 5.0 mg/L monthly average and 6.7 mg/L for the weekly average; less stringent than the current limits. Therefore, the existing ammonia limitations of 3.4 mg/L monthly and 4.6 mg/L weekly averages are proposed to be carried forward with this reissuance.

See **Attachment 8** for the ammonia limitation derivations for this reissuance and the previous reissuance.

2). Total Residual Chlorine:

Chlorine is used for disinfection and is potentially in the discharge. Staff calculated WLAs for TRC using current critical flows and the mixing allowance. In accordance with current DEQ guidance, staff used a default data point of 0.2 mg/L and the calculated AWLAs to derive limits. A monthly average of 0.005 mg/L and a weekly average limit of 0.006 mg/L are proposed for this discharge (see **Attachment 9**).

3). Metals/Organics:

It is staff's best professional judgement, based on the source(s) of the wastewater, limits are not warranted.

c. Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants

No changes to Dissolved Oxygen (D.O.), Biochemical Oxygen Demand-5 day (BOD_5), Total Suspended Solids (TSS) and pH limitations are proposed.

BOD_5 limitations are based on the Federal Secondary Treatment Standards of at least 85% removal.

It is staff's practice to equate the Total Suspended Solids limits with the BOD_5 limits since the two pollutants are closely related in terms of treatment of domestic sewage.

The D.O. limitations are based on the Virginia Institute of Marine Science (VIMS) Model and are set to ensure that the receiving stream D.O. does not decrease more than 0.2 mg/L to meet the requirements of the antidegradation policy for Tier 2 waters.

pH limitations are set at the water quality criteria.

E. coli limitations are in accordance with the Water Quality Standards 9VAC25-260-170.

d. Effluent Annual Average Limitations and Monitoring, Outfall 001 – Nutrients

VPDES Regulation 9VAC25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

As discussed in Section 15, significant portions of the Chesapeake Bay and its tributaries are listed as impaired with nutrient enrichment cited as one of the primary causes. Virginia has committed to protecting and restoring the Bay and its tributaries. There are three regulations that necessitate the inclusion of nutrient limitations:

- 9VAC25-40 – *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* requires new or expanding discharges with design flows of ≥ 0.04 MGD to treat for TN and TP to either BNR levels (TN = 8 mg/L; TP = 1.0 mg/L) or SOA levels (TN = 3.0 mg/L and TP = 0.3 mg/L).

- 9VAC25-720 – *Water Quality Management Plan Regulation* sets forth TN and TP maximum wasteload allocations for facilities designated as significant discharges, i.e., those with design flows of ≥ 0.5 MGD above the fall line and ≥ 0.1 MGD below the fall line. This regulation limits the total nitrogen and total phosphorus mass loadings from these discharges.

- 9VAC25-820 – *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia* became effective 1 January 2007. This regulation specifies and controls the nitrogen and phosphorus loadings from facilities and specifies facilities that must register under the general permit. Nutrient loadings for those facilities registered under the general permit as well as compliance schedules and other permit requirements, shall be authorized, monitored, limited, and otherwise regulated under the general permit and not this individual permit. This facility has coverage under this General Permit for the flow tiers of 0.125 MGD and 0.210 MGD; the permit number is VAN020113.

Monitoring for Nitrates + Nitrites, Total Kjeldahl Nitrogen, Total Nitrogen and Total Phosphorus for the 0.125 MGD and 0.210 MGD flow tiers are included in this permit. The monitoring is needed to protect the Water Quality Standards of the Chesapeake Bay. Monitoring frequencies are set at the frequencies set forth in 9VAC25-820.

Annual average effluent limitations, as well as monthly and year to date calculations for Total Nitrogen and Total Phosphorus are included in this individual permit for the aforementioned expanded flow tiers.

Per the Registration List for 9VAC25-820-70, Four Winds Campground has a wasteload allocation of 2,278 lbs/year for Total Nitrogen and 305 lbs/year for Total Phosphorus. These wasteload allocations are based on the secondary treatment level at the current design flow of 0.0375 MGD. In accordance with 9VAC25-40-70.A.4., the concentration limits prescribed by 9VAC25-40-70.A.1. are not necessary to maintain the existing nutrient loadings above.

Therefore, in lieu of a Total Nitrogen concentration limitation of 3.0 mg/L as prescribed by 9VAC25-40-70.A.1., a limit of 6.0 mg/L shall apply at the 0.125 MGD flow tier and 3.6 mg/L at the 0.210 MGD flow tier which produces a no net increase in the annual TN loadings from this facility.

9VAC25-40-70.A.1. states that a Total Phosphorus concentration limitation of 0.3 mg/L shall be applied to expanding facilities that discharge into tidal waters. However, as provided under 9VAC25-40-70.A.4., a limit of 0.80 mg/L at the 0.125 MGD flow tier and a limit of 0.48 mg/L may be applied; again, with no net increase in the annual TP loadings from this facility.

The primary purpose of the above regulations is to not allow any increases in nutrient loadings and to reduce current loadings where possible.

Total Nitrogen and Total Phosphorus annual loadings are governed by the general permit VAN020113 for the 0.125 MGD and 0.210 MGD facilities.

e. Effluent Limitations and Monitoring Summary.

The effluent limitations are presented in the following table. Limits were established for BOD_5, Total Suspended Solids, Ammonia, pH, Dissolved Oxygen, Total Residual Chlorine and *E. coli*. Total Nitrogen, Total Phosphorus and Nitrate+Nitrite limits/monitoring were established for the 0.125 MGD and 0.210 MGD facility.

The limit for Total Suspended Solids is based on Best Professional Judgement.

The mass loading (kg/d) for monthly and weekly averages were calculated by multiplying the concentration values (mg/L), with the flow values (in MGD) and then a conversion factor of 3.785.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual.

The VPDES Permit Regulation 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal for BOD/cBOD and TSS (or 65% for equivalent to secondary). During the last permit term, this facility conducted influent monitoring that indicated the minimum removal rate was being achieved.

18. Antibacksliding:

The backsliding proposed with this reissuance conforms to the anti-backsliding provisions of Section 402(o) of the Clean Water Act, 9VAC25-31-220.L., and 40 § CFR 122.44.

The existing Total Nitrogen and Total Phosphorus annual concentration limits at the 0.125 MGD and 0.210 MGD flow tiers were based on those values utilized to set the wasteload allocations in the Rappahannock River Basin, 9VAC25-720-70.C. However, in accordance with 9VAC25-40-70.A.4., those concentration values or those prescribed by 9VAC25-40-70.A.1., are not necessary to maintain the existing nutrient loadings at the current 0.0375 MGD design flow. The proposed TN and TP annual concentration limits are in accordance with 9VAC25-40-70.A.1. and with no net increase in the annual nutrient loadings from this facility at the expanded flow tiers.

It is staff's best professional judgement that the current annual concentration limits for the 0.125 MGD and 0.210 MGD flow tiers were consistent with guidance at that time and that the proposed concentration limitations are in accordance with current agency guidance and practice.

19a. Effluent Limitations/Monitoring Requirements:

Design flow is 0.0375 MGD.

Effective Dates: During the period beginning with the permit effective date and lasting until the issuance of the CTO for the 0.125 MGD facility or the permit expiration date, whichever comes first.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	1/D	Estimate
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
BOD_5	1	30 mg/L 4.3 kg/day	45 mg/L 6.4 kg/day	NA	NA	1/M	Grab
Total Suspended Solids (TSS)	2	30 mg/L 4.3 kg/day	45 mg/L 6.4 kg/day	NA	NA	1/M	Grab
Dissolved Oxygen (DO)	3,5	NA	NA	6.0 mg/L	NA	1/D	Grab
Ammonia, as N (May – October)	3,5	4.2 mg/L	4.2 mg/L	NA	NA	1/M	Grab
Ammonia, as N (November – April)	3,5	6.3 mg/L	6.3 mg/L	NA	NA	1/M	Grab
E. coli (Geometric Mean) [(a) (b)]	3	126 n/100 mL	NA	NA	NA	1/W	Grab
Total Residual Chlorine (after contact tank)	4	NA	NA	1.0 mg/L	NA	1/D	Grab
Total Residual Chlorine (after dechlorination)	3	0.005 mg/L	0.006 mg/L	NA	NA	1/D	Grab

The basis for the limitations codes are:

1. Federal Effluent Requirements for Secondary Treatment
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. VIMS Model – **Attachment 7**

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.

1/D = Once every day.
1/W = Once every week.
1/M = Once every month.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.
Grab = An individual sample collected over a period of time not to exceed 15-minutes.

[(a)] Samples shall be collected between the hours of 10 A.M. and 4 P.M.

[(b)] The permittee shall sample and submit *E. coli* results at the frequency of once every week for three (3) months.

If all reported results for *E. coli* do not exceed 126 n/100mL, reported as the geometric mean, the permittee may submit a written request to DEQ-NRO for a reduction in the sampling frequency to once per quarter.

Upon approval, the permittee shall collect four (4) samples during one month within each quarterly monitoring period as defined below. The results shall be reported as the geometric mean.

The quarterly monitoring periods shall be January through March, April through June, July through September and October through December. The DMR shall be submitted no later than the 10th day of the month following the monitoring period.

Should any of the quarterly monitoring results for *E. coli* exceed 126 n/100mL, reported as the geometric mean, the monitoring frequency shall revert to once per week for the remainder of the permit term.

19b. Effluent Limitations/Monitoring Requirements:

Design flow is 0.125 MGD.

Effective Dates: During the period beginning with the issuance of the CTO for the 0.125 MGD facility and lasting until the issuance of the CTO for the 0.210 MGD facility or the permit expiration date, whichever comes first.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
BOD_5	1,5	30 mg/L 14 kg/day	45 mg/L 21 kg/day	NA	NA	3D/W	8H-C
Total Suspended Solids (TSS)	1,2	30 mg/L 14 kg/day	45 mg/L 21 kg/day	NA	NA	3D/W	8H-C
Dissolved Oxygen (DO)	3,5	NA	NA	6.0 mg/L	NA	1/D	Grab
Ammonia, as N (May – October)	3,5	2.3 mg/L	3.1 mg/L	NA	NA	3D/W	8H-C
Ammonia, as N (November – April)	3,5	3.4 mg/L	4.6 mg/L	NA	NA	3D/W	8H-C
E. coli (Geometric Mean) [a]	3	126 n/100 mL	NA	NA	NA	1/W	Grab
Total Residual Chlorine (after contact tank)	4	NA	NA	1.0 mg/L	NA	3/D at 4-hr Intervals	Grab
Total Residual Chlorine (after dechlorination)	3	0.005 mg/L	0.006 mg/L	NA	NA	3/D at 4-hr Intervals	Grab
Nitrate+Nitrite, as N	3,6	NL mg/L	NA	NA	NA	1/2W	8H-C
Total Nitrogen [b]	3,6	NL mg/L	NA	NA	NA	1/2W	Calculated
Total Nitrogen – Year to Date [c]	3,6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Nitrogen – Calendar Year [c]	3,6	6.0 mg/L	NA	NA	NA	1/Y	Calculated
Total Phosphorus	3	NL mg/L	NA	NA	NA	1/2W	8H-C
Total Phosphorus – Year to Date [c]	3,6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Phosphorus – Calendar Year [c]	3,6	0.80 mg/L	NA	NA	NA	1/Y	Calculated

The basis for the limitations codes are:

1. Federal Effluent Requirements for Secondary Treatment
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. VIMS Model – **Attachment 7**
6. 9VAC25-40 (Nutrient Regulation)

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

3/D = Three times every day.
1/D = Once every day.
3D/W = Three days a week.
1/2W = Once every 2 weeks, > 7 days apart.
1/M = Once every month.
1/Y = Once every calendar year.

8H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 8-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of eight (8) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum eight (8) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

[a] Samples shall be collected between the hours of 10 A.M. and 4 P.M.

[b] Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

[c] See Section 20.a. for the calculation of the Nutrient Calculations.

19c. Effluent Limitations/Monitoring Requirements:

Design flow is 0.210 MGD.

Effective Dates: During the period beginning with the issuance of the CTO for the 0.210 MGD facility and lasting until the permit expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
BOD_5	1,5	30 mg/L 24 kg/day	45 mg/L 36 kg/day	NA	NA	3D/W	8H-C
Total Suspended Solids (TSS)	1,2	30 mg/L 24 kg/day	45 mg/L 36 kg/day	NA	NA	3D/W	8H-C
Dissolved Oxygen (DO)	3,5	NA	NA	6.0 mg/L	NA	1/D	Grab
Ammonia, as N (May – October)	3,5	2.3 mg/L	3.1 mg/L	NA	NA	3D/W	8H-C
Ammonia, as N (November – April)	3,5	3.4 mg/L	4.6 mg/L	NA	NA	3D/W	8H-C
E. coli (Geometric Mean) [a]	3	126 n/100 mL	NA	NA	NA	1/W	Grab
Total Residual Chlorine (after contact tank)	4	NA	NA	1.0 mg/L	NA	3/D at 4-hr Intervals	Grab
Total Residual Chlorine (after dechlorination)	3	0.005 mg/L	0.006 mg/L	NA	NA	3/D at 4-hr Intervals	Grab
Nitrate+Nitrite, as N	3,6	NL mg/L	NA	NA	NA	1/2W	8H-C
Total Nitrogen [b]	3,6	NL mg/L	NA	NA	NA	1/2W	Calculated
Total Nitrogen – Year to Date [c]	3,6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Nitrogen – Calendar Year [c]	3,6	3.6 mg/L	NA	NA	NA	1/Y	Calculated
Total Phosphorus	3	NL mg/L	NA	NA	NA	1/2W	8H-C
Total Phosphorus – Year to Date [c]	3,6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Phosphorus – Calendar Year [c]	3,6	0.48 mg/L	NA	NA	NA	1/Y	Calculated

The basis for the limitations codes are:

1. Federal Effluent Requirements for Secondary Treatment
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. VIMS Model – **Attachment 7**
6. 9VAC25-40 (Nutrient Regulation)

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

3/D = Three times every day.
1/D = Once every day.
3D/W = Three days a week.
1/2W = Once every 2 weeks, > 7 days apart.
1/M = Once every month.
1/Y = Once every calendar year.

8H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 8-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of eight (8) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum eight (8) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

[a] Samples shall be collected between the hours of 10 A.M. and 4 P.M.

[b] Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

[c] See Section 20.a. for the calculation of the Nutrient Calculations.

20. Other Permit Requirements:

Part I.B. of the permit contains additional chlorine monitoring requirements, quantification levels and compliance reporting instructions.

These additional chlorine requirements are necessary per the Sewage Collection and Treatment Regulations at 9VAC25-70 and by the Water Quality Standards at 9VAC25-260-170. Minimum chlorine residual must be maintained at the exit of the chlorine contact tank to assure adequate disinfection. No more that 10% of the monthly test results for TRC at the exit of the chlorine contact tank shall be < 1.0 mg/L with any TRC < 0.6 mg/L considered a system failure. *E. coli* limits are defined in this section as well as monitoring requirements to take effect should an alternate means of disinfection be used.

9VAC25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

The calculations for the Nitrogen and Phosphorus parameters shall be in accordance with the calculations set forth in 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.* §62.1-44.19:13 of the Code of Virginia define how annual nutrient loads are to be calculated; this is carried forward in 9VAC25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, these reporting calculations are intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

21. Other Special Conditions:

a. 95% Capacity Reopener. The VPDES Permit Regulation at 9VAC25-31-200.B.4. requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. The facility is a PVOTW.

b. Indirect Dischargers. Required by VPDES Permit Regulation, 9VAC25-31-200 B.1. and B.2. for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c. O&M Manual Requirement. Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190.E. On or before 27 September 2011, the permittee shall submit for approval an Operations and Maintenance (O&M) Manual or a statement confirming the accuracy and completeness of the current O&M Manual to the Department of Environmental Quality, Northern Regional Office (DEQ-NRO). Future changes to the facility must be addressed by the submittal of a revised O&M Manual within 90 days of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.

d. CTC, CTO Requirement. The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.

e. Licensed Operator Requirement. The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9VAC25-31-200.C., and Rules and Regulations for Waterworks and Wastewater Works Operators (18VAC160-20-10 et seq.) requires licensure of operators. This facility requires a Class III operator.

f. Reliability Class. The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet reliability Class I.

g. Sludge Reopener. The VPDES Permit Regulation at 9VAC25-31-220.C. requires all permits issued to treatment works treating domestic sewage (including sludge-only facilities) include a reopener clause allowing incorporation of any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the CWA. The facility includes a sewage treatment works.

h. Sludge Use and Disposal. The VPDES Permit Regulation at 9VAC25-31-100.P; 220.B.2., and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. The facility includes a treatment works treating domestic sewage.

i. Treatment Works Closure Plan. The State Water Control Law §62.1-44.15:1.1, makes it illegal for an owner to cease operation and fail to implement a closure plan when failure to implement the plan would result in harm to human health or the environment. This condition is used to notify the owner of the need for a closure plan where a facility is being replaced or is expected to close.

j. Nutrient Offsets. The Virginia General Assembly, in their 2005 session, enacted Article 4.02 (Chesapeake Bay Watershed Nutrient Credit Exchange Program) to the Code of Virginia to address nutrient loads to the Bay. Section 62.1-44.19:15 sets forth the requirements for new and expanded dischargers, which are captured by the requirements of the law, including the requirement that non-point load reductions acquired for the purpose of offsetting nutrient discharges be enforced through the individual VPDES permit.

k. E3/E4. 9VAC25-40-70.B. authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

l. Nutrient Reopener. 9VAC25-40-70.A. authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9VAC25-31-390.A. authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

m. Discharge Pipe Integrity. The permittee shall visually inspect and photograph the discharge pipe annually to confirm the integrity of the line. Documentation of the inspection shall be submitted with the December DMR due January 10th of each year for the term of the permit.

n. Groundwater Monitoring. State Water Control Law § 62.1-1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. Ground water monitoring for parameters of concern will indicate whether possible lagoon seepage is resulting in violations to the State Water Control Board's Ground Water Standards. Ground water monitoring consists of five monitoring wells: MW1, MW2, MW3, MW4 and MW5 (control).

Staff noted the following upon reviewing the data collected during the last permit term:

1). Found that the results were inconclusive (**Attachment 10**);

2). Ammonia and nitrate were detected in the upgradient Well No. 5;

3). Well No. 5 is also located at the edge of the golf course;

4). Well No. 1 is located at the property line abutting a large tree nursery;

Further investigation revealed that the facility and monitoring wells are situated in a Bojac sandy loam soil. These soils have a high hydraulic conductivity of 1.98 to 5.95 inches/hour. This could lend to ammonia and nitrate detection in Wells No. 1 and 5 due to the use of fertilizers on the golf course and the nursery.

It is staff's best professional judgement that groundwater monitoring continue; however, at a reduced frequency of once per year and during a period of inactivity (i.e. fertilizer use) at the golf course and nursery. This may enable staff to ascertain if the contaminate source is the lagoon or the grounds keeping/nursery activity.

The permittee shall monitor for the parameters found in **Attachment 11** during the first quarter of each year, starting in 2012, during this permit term.

o. Lagoon Liner Require ment. If this facility must or should place the second, unlined lagoon into service, the permittee shall submit for approval plans and specifications 90 days prior to operation. This submittal shall include at a minimum the reason for placing the lagoon into service, the type of liner proposed, installation timeline and integrity verification after installation is complete.

p. TMDL Reopener. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL that may be developed and approved for the receiving stream.

22. Permit Section Part II. Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

23. Changes to the Permit from the Previously Issued Permit:

a. Special Conditions:

- Nutrient Offsets, E3/E4 and Nutrient Reopener were included with this reissuance per current agency guidance.
- Sludge Management Plan was removed with this reissuance.
- The Financial Assurance condition/discussion found in the previous fact sheet, stating that it was not applicable to this facility since it is seasonal, was removed with this reissuance.
- Lagoon Liner Requirement was added with this reissuance.

b. Monitoring and Effluent Limitations:

- The loading limitations for BOD_5 and TSS at the 0.210 MGD design flow were incorrectly calculated during the previous reissuance and have been rectified.
- The loading limitation and reporting requirements for Total Nitrogen and Total Phosphorus were removed with this reissuance at the 0.125 MGD and 0.210 MGD design flows. Nutrient loadings are governed by the Nutrient General Permit and this reflects current agency guidance.
- The concentration limitations for Total Nitrogen and Total Phosphorus at the 0.125 MGD and 0.210 MGD design flows were revised to reflect current agency guidance. See Section 18 of this Fact Sheet for the explanation.
- Orthophosphate monitoring was removed for the 0.125 MGD and 0.210 MGD flow tiers based on current agency guidance.
- Influent monitoring for BOD_5 has been removed with this reissuance.
- Groundwater monitoring frequency was reduced from quarterly to once per year during the first quarter of each year.

24. Variance/Alternate Limits or Conditions: Not Applicable.

25. Public Notice Information:

First Public Notice Date: 26 May 2011 Second Public Notice Date: 2 June 2011

Public Notice Information is required by 9VAC25-31-280.B. All pertinent information is on file and may be inspected and copied by contacting the: DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3873, Douglas.Frasier@deq.virginia.gov. See **Attachment 12** for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. A public hearing may be held, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless a public hearing is granted. Due notice of any public hearing will be given. The public may request an electronic copy of the draft permit and fact sheet or review the draft permit and application at the DEQ Northern Regional Office by appointment.

26. 303 (d) Listed Stream Segments and Total Max. Daily Loads (TMDL):

This facility discharges to a 303(d) listed stream due to bacteria and PCB impairments. The Tidal Freshwater Rappahannock Bacteria TMDL included a wasteload allocation of 3.65 E+11 cfu/year for *E. coli* bacteria. The proposed limit of 126 n/100mL, reported as geometric mean, ensures that this discharge will not exceed this allocation.

Staff concluded that this facility will not be required to conduct PCB monitoring at the current design flow. However, the facility may be required to conduct monitoring after an expansion is completed.

27. Additional Comments:

Previous Board Action(s):	This facility was referred to enforcement in 2007 due to minor permit violations and administrative requirements of the permit that were not received per the established due dates. A Letter of Agreement was drafted in lieu of a Consent Order in order to bring the facility back into compliance. At the time of this Fact Sheet, the facility was again referred to enforcement due to minor effluent exceedances and administrative inactions.
Staff Comments:	The permit application was received on 24 January 2011 (four months late); resulting in a delayed reissuance.
Public Comment:	No comments were received during the public notice.
EPA Checklist:	The checklist can be found in **Attachment 13**.

Fact Sheet Attachments

Table of Contents

Four Winds Campground STP
VA0060429
2011 Reissuance

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Office of Water Quality Assessments
629 East Main Street P.O. Box 10009 Richmond, Virginia 23219

SUBJECT: Flow Frequency Determination
Four Winds Campground – #VA0060429

TO: James Olson, NRO

FROM: Paul E. Herman, P.E., WQAP

DATE: September 29, 1999

COPIES: Ron Gregory, Charles Martin, File

This memo supersedes my April 3, 1995, memo to Valerie Ford concerning the subject VPDES permit.

The Four Winds Campground discharges to the Rappahannock River near Rappahannock Academy, VA. Flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

At the discharge point, the Rappahannock River is tidal. Flow frequencies cannot be calculated for tidal water bodies. Dilution ratios should be used to evaluate the impact this discharge has on water quality in the tidal Rappahannock River.

For modeling purposes, flow frequencies for the fresh water inflow to the tidal Rappahannock River are provided below.

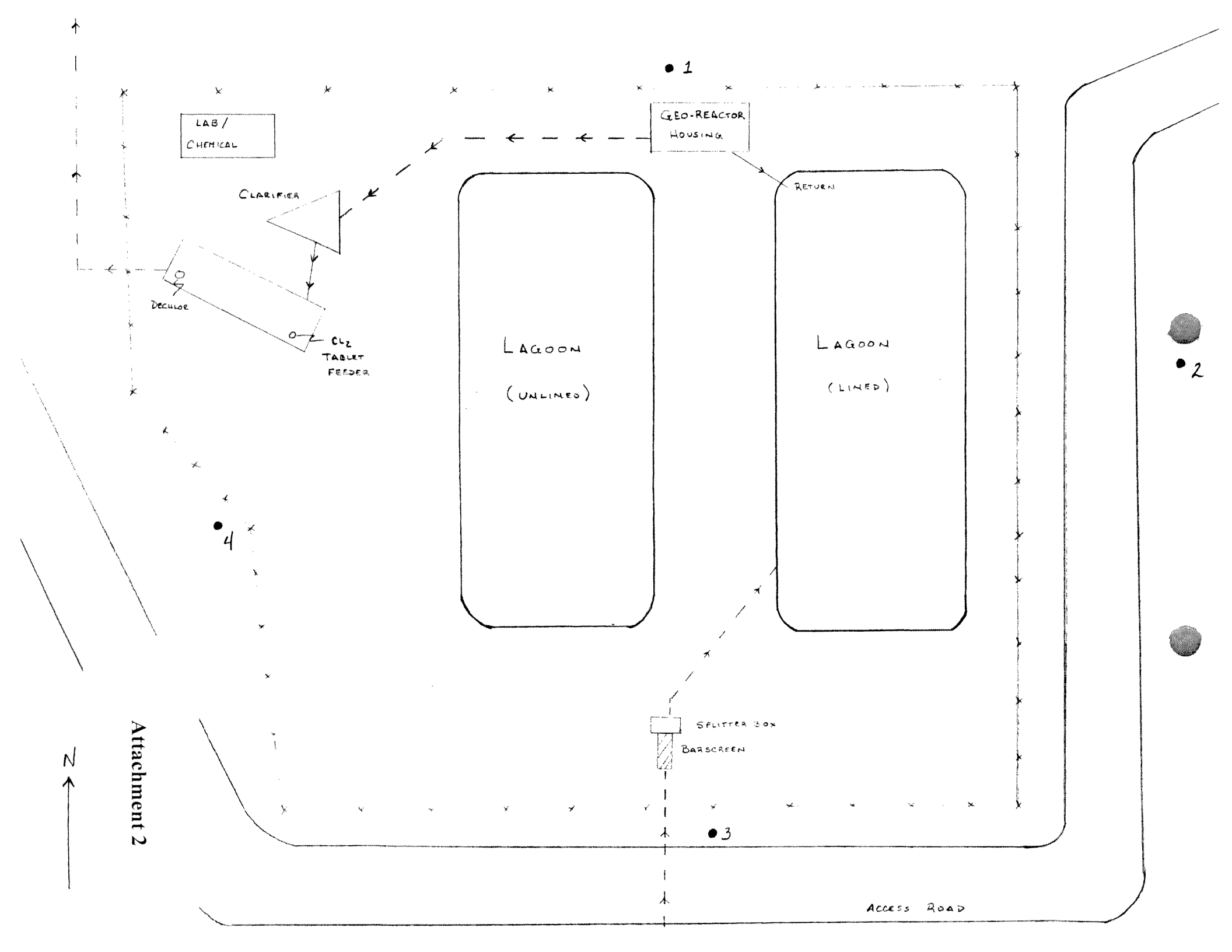
Rappahannock River at Fredericksburg, VA (#01668000):

Drainage Area = 1,596 mi^2

1Q10 = 42 cfs	High Flow 1Q10 = 311 cfs
7Q10 = 51 cfs	High Flow 7Q10 = 359 cfs
30Q5 = 127 cfs	HM = 475 cfs

The high flow months are January through May. If you have any questions concerning this analysis, please let me know.

Attachment 1



Attachment 2

Attachment 3

SUMMARY

Recommendations for action noted during the June 5, 2007 inspection (relative updates are in Red BOLD Type):

1. **DEQ recommends continued research and selection of an alternate source of media to prevent the potential loss of unit function.** Media has been ordered and replaced. Ammonia results are within permit limits.
2. **Inspect and maintain access to the outfall; submit additional photos to DEQ during a period of discharge.** It was noted during the inspection that the 2008 photos have been scheduled for October/November once all overgrowth dies back.
3. **DEQ recommends evaluating the sludge depth in the lagoon and schedule clean out as necessary.** Per the letter of agreement dated July 28, 2007, the sludge depth has been evaluated.
4. **Permit VA0060429 Part I, Page 1, Section A, Number 1 requires the monitoring of INFLUENT BOD ANNUALLY. The monitoring should be conducted by April of each year and reported to DEQ on the DMR by May 10 of each year.**
5. **Provide DEQ with a report on the sanitary sewer collection system and inflow & infiltration (I&I) problems. Report to include the following: (1) Number of current and planned connections; (2) Approximate total length of sewer lines; (3) Makeup of collection system (gravity, low pressure grinder pump, force main, etc.); (4) Makeup of pipe materials (PVC, ductile iron, clay, etc.); (5) Number of pump stations, alternate power source provided, alarm system provided; (6) A description of the I&I Program and responsibilities; (7) Annual budget for I&I activities.** The report was received December 11, 2007.

Comments and Recommendations for action noted during the September 15, 2008 inspection:

1. **Foam was noted flowing from the Geo-Reactor (photo 4). Facility staff should evaluate the unit and determine the appropriate repair approach.**

Sampling Results:
Mr. Barham performed field measurements @ 0830 on 9/15/08:
pH: 6.97 s.u
DO: 8.39 mg/L
CL_2 @ CCT: 2.1 mg/L
Effluent CL_2: <QL

Dissolved Oxygen Criteria (9 VAC 25-260-185)

Designated Use	Criteria Concentration/Duration	Temporal Application
Migratory fish spawning and nursery	7-day mean > 6 mg/L (tidal habitats with 0-0.5 ppt salinity)	February 1 – May 31
	Instantaneous minimum> 5 mg/L	
Open-water[1,2]	30-day mean > 5.5 mg/L (tidal habitats with 0-0.5 ppt salinity) 30-day mean > 5 mg/L (tidal habitats with >0.5 ppt salinity)	Year-round
	7-day mean > 4 mg/L	
	Instantaneous minimum > 3.2 mg/L at temperatures < 29°C Instantaneous minimum > 4.3 mg/L at temperatures > 29°C	
Deep-water	30-day mean >3 mg/L	June 1-September 30
	1-day mean > 2.3 mg/L	
	Instantaneous minimum > 1.7 mg/L	
Deep-channel	Instantaneous minimum > 1 mg/L	June 1-September 30

[1]See subsection aa of 9 VAC 25-260-310 for site specific seasonal open-water dissolved oxygen criteria applicable to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries.

[2]In applying this open-water instantaneous criterion to the Chesapeake Bay and its tidal tributaries where the existing water quality for dissolved oxygen exceeds an instantaneous minimum of 3.2 mg/L, that higher water quality for dissolved oxygen shall be provided antidegradation protection in accordance with section 30 subsection A.2 of the Water Quality Standards.

SALTWATER AND TRANSITION ZONES
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Four Winds Campground Permit No.: VA0060429 Version: OWP Guidance Memo 00-2011 (8/24/00)
Receiving Stream: Rappahannock River

Stream Information

Mean Hardness (as CaCO3) =	29.2	mg/l
90th % Temperature (Annual) =	27.8	(° C)
90th % Temperature (Winter) =	14.3	(° C)
90th % Maximum pH =	7.4	
10th % Maximum pH =	6.8	
Tier Designation (1 or 2) =	2	
Early Life Stages Present Y/N =	Y	
Tidal Zone =	2	(1 = saltwater, 2 = transition zone)
Mean Salinity =	0	(g/kg)

Mixing Information

Design Flow (MGD)	0.21
Acute WLA multiplier	2
Chronic WLA multiplier	50
Human health WLA multiplier	50

Effluent Information

Mean Hardness (as CaCO3) =	50	mg/L
90 % Temperature (Annual) =	25	(° C)
90 % Temperature (Winter) =	15	(° C)
90 % Maximum pH =	7.8	SU
10 % Maximum pH =	7.3	SU
Discharge Flow =	0.21	MGD

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Acenapthene	0	--	--	9.9E+02	--	--	5.0E+04	--	--	9.9E+01	--	--	5.0E+03	--	--	**5.0E+03**
Acrolein		--	--	9.3E+00	--	--	4.7E+02	--	--	9.3E-01	--	--	4.7E+01	--	--	**4.7E+01**
Acrylonitrile [C]		--	--	2.5E+00	--	--	1.3E+02	--	--	2.5E-01	--	--	1.3E+01	--	--	**1.3E+01**
Aldrin [C]	0	1.3E+00	--	5.0E-04	2.6E+00	--	2.5E-02	3.3E-01	--	5.0E-05	6.5E-01	--	2.5E-03	**6.5E-01**	--	**2.5E-03**
Ammonia-N (mg/l) - Annual	0	#######	1.65E+00	--	1.73E+01	8.25E+01	--	2.16E+00	4.12E-01	--	4.32E+00	2.06E+01	--	**4.32E+00**	**2.06E+01**	--
Ammonia-N (mg/l) - Winter	0	#######	4.44E+00	--	3.65E+01	2.22E+02	--	4.57E+00	1.11E+00	--	9.14E+00	5.55E+01	--	**9.14E+00**	**5.55E+01**	--
Anthracene	0	--	--	4.0E+04	--	--	2.0E+06	--	--	4.0E+03	--	--	2.0E+05	--	--	**2.0E+05**
Antimony	0	--	--	6.4E+02	--	--	3.2E+04	--	--	6.4E+01	--	--	3.2E+03	--	--	**3.2E+03**
Arsenic	0	6.9E+01	3.6E+01	--	1.4E+02	1.8E+03	--	1.7E+01	9.0E+00	--	3.5E+01	4.5E+02	--	**3.5E+01**	**4.5E+02**	--
Benzene [C]	0	--	--	5.1E+02	--	--	2.6E+04	--	--	5.1E+01	--	--	2.6E+03	--	--	**2.6E+03**
Benzidine [C]		--	--	2.0E-03	--	--	1.0E-01	--	--	2.0E-04	--	--	1.0E-02	--	--	**1.0E-02**
Benzo (a) anthracene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	1.8E-02	--	--	9.0E-01	--	--	**9.0E-01**
Benzo (b) fluoranthene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	1.8E-02	--	--	9.0E-01	--	--	**9.0E-01**
Benzo (k) fluoranthene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	1.8E-02	--	--	9.0E-01	--	--	**9.0E-01**
Benzo (a) pyrene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	1.8E-02	--	--	9.0E-01	--	--	**9.0E-01**
Bis2-Chloroethyl Ether [C]	0	--	--	5.3E+00	--	--	2.7E+02	--	--	5.3E-01	--	--	2.7E+01	--	--	**2.7E+01**
Bis2-Chloroisopropyl Ether	0	--	--	6.5E+04	--	--	3.3E+06	--	--	6.5E+03	--	--	3.3E+05	--	--	**3.3E+05**
Bis2-Ethylhexyl Phthalate [C]	0	--	--	2.2E+01	--	--	1.1E+03	--	--	2.2E+00	--	--	1.1E+02	--	--	**1.1E+02**
Bromoform [C]	0	--	--	1.4E+03	--	--	7.0E+04	--	--	1.4E+02	--	--	7.0E+03	--	--	**7.0E+03**
Butylbenzylphthalate	0	--	--	1.9E+03	--	--	9.5E+04	--	--	1.9E+02	--	--	9.5E+03	--	--	**9.5E+03**
Cadmium	0	1.4E+00	4.4E-01	--	2.8E+00	2.2E+01	--	3.4E-01	1.1E-01	--	6.9E-01	5.5E+00	--	**6.9E-01**	**5.5E+00**	--
Carbon Tetrachloride [C]	0	--	--	1.6E+01	--	--	8.0E+02	--	--	1.6E+00	--	--	8.0E+01	--	--	**8.0E+01**
Chlordane [C]	0	9.0E-02	4.0E-03	8.1E-03	1.8E-01	2.0E-01	4.1E-01	2.3E-02	1.0E-03	8.1E-04	4.5E-02	5.0E-02	4.1E-02	**4.5E-02**	**5.0E-02**	**4.1E-02**

Attachment 6

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
TRC	0	1.9E+01	1.1E+01	--	3.8E+01	5.5E+02	--	4.8E+00	2.8E+00	--	9.5E+00	1.4E+02	--	**9.5E+00**	**1.4E+02**	**--**
Chlorine Prod. Oxidant	0	1.3E+01	7.5E+00	--	2.6E+01	3.8E+02	--	3.3E+00	1.9E+00	--	6.5E+00	9.4E+01	--	**6.5E+00**	**9.4E+01**	**--**
Chlorobenzene		--	--	1.6E+03	--	--	8.0E+04	--	--	1.6E+02	--	--	8.0E+03	--	--	**8.0E+03**
Chlorodibromomethane [C]	0	--	--	1.3E+02	--	--	6.5E+03	--	--	1.3E+01	--	--	6.5E+02	--	--	**6.5E+02**
Chloroform	0	--	--	1.1E+04	--	--	5.5E+05	--	--	1.1E+03	--	--	5.5E+04	--	--	**5.5E+04**
2-Chloronaphthalene	0	--	--	1.6E+03	--	--	8.0E+04	--	--	1.6E+02	--	--	8.0E+03	--	--	**8.0E+03**
2-Chlorophenol	0	--	--	1.5E+02	--	--	7.5E+03	--	--	1.5E+01	--	--	7.5E+02	--	--	**7.5E+02**
Chlorpyrifos	0	1.1E-02	5.6E-03	--	2.2E-02	2.8E-01	--	2.8E-03	1.4E-03	--	5.5E-03	7.0E-02	--	**5.5E-03**	**7.0E-02**	**--**
Chromium III	0	2.7E+02	2.7E+01	--	5.3E+02	1.4E+03	--	6.7E+01	6.8E+00	--	1.3E+02	3.4E+02	--	**1.3E+02**	**3.4E+02**	**--**
Chromium VI	0	1.6E+01	1.1E+01	--	3.2E+01	5.5E+02	--	4.0E+00	2.8E+00	--	8.0E+00	1.4E+02	--	**8.0E+00**	**1.4E+02**	**--**
Chrysene [C]	0	--	--	1.8E-02	--	--	9.0E-01	--	--	1.8E-03	--	--	9.0E-02	--	--	**9.0E-02**
Copper	0	5.6E+00	3.2E+00	--	1.1E+01	1.6E+02	--	1.4E+00	7.9E-01	--	2.8E+00	4.0E+01	--	**2.8E+00**	**4.0E+01**	**--**
Cyanide, Free	0	1.0E+00	1.0E+00	1.6E+04	2.0E+00	5.0E+01	8.0E+05	2.5E-01	2.5E-01	1.6E+03	5.0E-01	1.3E+01	8.0E+04	**5.0E-01**	**1.3E+01**	**8.0E+04**
DDD [C]	0	--	--	3.1E-03	--	--	1.6E-01	--	--	3.1E-04	--	--	1.6E-02	--	--	**1.6E-02**
DDE [C]	0	--	--	2.2E-03	--	--	1.1E-01	--	--	2.2E-04	--	--	1.1E-02	--	--	**1.1E-02**
DDT [C]	0	1.3E-01	1.0E-03	2.2E-03	2.6E-01	5.0E-02	1.1E-01	3.3E-02	2.5E-04	2.2E-04	6.5E-02	1.3E-02	1.1E-02	**6.5E-02**	**1.3E-02**	**1.1E-02**
Demeton	0	--	1.0E-01	--	--	5.0E+00	--	--	2.5E-02	--	--	1.3E+00	--	--	**1.3E+00**	**--**
Diazinon	0	1.7E-01	1.7E-01	--	3.4E-01	8.5E+00	--	4.3E-02	4.3E-02	--	8.5E-02	2.1E+00	--	**8.5E-02**	**2.1E+00**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	1.8E-02	--	--	9.0E-01	--	--	**9.0E-01**
1,2-Dichlorobenzene	0	--	--	1.3E+03	--	--	6.5E+04	--	--	1.3E+02	--	--	6.5E+03	--	--	**6.5E+03**
1,3-Dichlorobenzene	0	--	--	9.6E+02	--	--	4.8E+04	--	--	9.6E+01	--	--	4.8E+03	--	--	**4.8E+03**
1,4-Dichlorobenzene	0	--	--	1.9E+02	--	--	9.5E+03	--	--	1.9E+01	--	--	9.5E+02	--	--	**9.5E+02**
3,3-Dichlorobenzidine [C]	0	--	--	2.8E-01	--	--	1.4E+01	--	--	2.8E-02	--	--	1.4E+00			
Dichlorobromomethane [C]	0	--	--	1.7E+02	--	--	8.5E+03	--	--	1.7E+01	--	--	8.5E+02	--	--	**8.5E+02**
1,2-Dichloroethane [C]	0	--	--	3.7E+02	--	--	1.9E+04	--	--	3.7E+01	--	--	1.9E+03	--	--	**1.9E+03**
1,1-Dichloroethylene	0	--	--	7.1E+03	--	--	3.6E+05	--	--	7.1E+02	--	--	3.6E+04	--	--	**3.6E+04**
1,2-trans-dichloroethylene	0	--	--	1.0E+04	--	--	5.0E+05	--	--	1.0E+03	--	--	5.0E+04	--	--	**5.0E+04**
2,4-Dichlorophenol	0	--	--	2.9E+02	--	--	1.5E+04	--	--	2.9E+01	--	--	1.5E+03	--	--	**1.5E+03**
1,2-Dichloropropane [C]	0	--	--	1.5E+02	--	--	7.5E+03	--	--	1.5E+01	--	--	7.5E+02	--	--	**7.5E+02**
1,3-Dichloropropene [C]	0	--	--	2.1E+02	--	--	1.1E+04	--	--	2.1E+01	--	--	1.1E+03	--	--	**1.1E+03**
Dieldrin [C]	0	7.1E-01	1.9E-03	5.4E-04	1.4E+00	9.5E-02	2.7E-02	1.8E-01	4.8E-04	5.4E-05	3.6E-01	2.4E-02	2.7E-03	**3.6E-01**	**2.4E-02**	**2.7E-03**
Diethyl Phthalate	0	--	--	4.4E+04	--	--	2.2E+06	--	--	4.4E+03	--	--	2.2E+05	--	--	**2.2E+05**
2,4-Dimethylphenol	0	--	--	8.5E+02	--	--	4.3E+04	--	--	8.5E+01	--	--	4.3E+03	--	--	**4.3E+03**
Dimethyl Phthalate	0	--	--	1.1E+06	--	--	5.5E+07	--	--	1.1E+05	--	--	5.5E+06	--	--	**5.5E+06**
Di-n-Butyl Phthalate	0	--	--	4.5E+03	--	--	2.3E+05	--	--	4.5E+02	--	--	2.3E+04	--	--	**2.3E+04**
2,4 Dinitrophenol	0	--	--	5.3E+03	--	--	2.7E+05	--	--	5.3E+02	--	--	2.7E+04	--	--	**2.7E+04**
2-Methyl-4,6-Dinitrophenol	0	--	--	2.8E+02	--	--	1.4E+04	--	--	2.8E+01	--	--	1.4E+03	--	--	**1.4E+03**
2,4-Dinitrotoluene [C]	0	--	--	3.4E+01	--	--	1.7E+03	--	--	3.4E+00	--	--	1.7E+02	--	--	**1.7E+02**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	5.1E-08	--	--	2.6E-06	--	--	5.1E-09	--	--	2.6E-07	--	--	**2.6E-07**
1,2-Diphenylhydrazine [C]	0	--	--	2.0E+00	--	--	1.0E+02	--	--	2.0E-01	--	--	1.0E+01	--	--	**1.0E+01**
Alpha-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	6.8E-02	4.4E-01	4.5E+03	8.5E-03	2.2E-03	8.9E+00	1.7E-02	1.1E-01	4.5E+02	**1.7E-02**	**1.1E-01**	**4.5E+02**

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Beta-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	6.8E-02	4.4E-01	4.5E+03	8.5E-03	2.2E-03	8.9E+00	1.7E-02	1.1E-01	4.5E+02	**1.7E-02**	**1.1E-01**	**4.5E+02**
Alpha + Beta Endosulfan	0	3.4E-02	8.7E-03	--	6.8E-02	4.4E-01	--	8.5E-03	2.2E-03	--	1.7E-02	1.1E-01	--	**1.7E-02**	**1.1E-01**	--
Endosulfan Sulfate	0	--	--	8.9E+01	--	--	4.5E+03	--	--	8.9E+00	--	--	4.5E+02	--	--	**4.5E+02**
Endrin	0	3.7E-02	2.3E-03	6.0E-02	7.4E-02	1.2E-01	3.0E+00	9.3E-03	5.8E-04	6.0E-03	1.9E-02	2.9E-02	3.0E-01	**1.9E-02**	**2.9E-02**	**3.0E-01**
Endrin Aldehyde	0	--	--	3.0E-01	--	--	1.5E+01	--	--	3.0E-02	--	--	1.5E+00	--	--	**1.5E+00**
Ethylbenzene	0	--	--	2.1E+03	--	--	1.1E+05	--	--	2.1E+02	--	--	1.1E+04	--	--	**1.1E+04**
Fluoranthene	0	--	--	1.4E+02	--	--	7.0E+03	--	--	1.4E+01	--	--	7.0E+02	--	--	**7.0E+02**
Fluorene	0	--	--	5.3E+03	--	--	2.7E+05	--	--	5.3E+02	--	--	2.7E+04	--	--	**2.7E+04**
Guthion	0	--	1.0E-02	--	--	5.0E-01	--	--	2.5E-03	--	--	1.3E-01	--	--	**1.3E-01**	--
Heptachlor [C]	0	5.3E-02	3.6E-03	7.9E-04	1.1E-01	1.8E-01	4.0E-02	1.3E-02	9.0E-04	7.9E-05	2.7E-02	4.5E-02	4.0E-03	**2.7E-02**	**4.5E-02**	**4.0E-03**
Heptachlor Epoxide [C]	0	5.3E-02	3.6E-03	3.9E-04	1.1E-01	1.8E-01	2.0E-02	1.3E-02	9.0E-04	3.9E-05	2.7E-02	4.5E-02	2.0E-03	**2.7E-02**	**4.5E-02**	**2.0E-03**
Hexachlorobenzene [C]	0	--	--	2.9E-03	--	--	1.5E-01	--	--	2.9E-04	--	--	1.5E-02	--	--	**1.5E-02**
Hexachlorobutadiene [C]	0	--	--	1.8E+02	--	--	9.0E+03	--	--	1.8E+01	--	--	9.0E+02	--	--	**9.0E+02**
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	4.9E-02	--	--	2.5E+00	--	--	4.9E-03	--	--	2.5E-01	--	--	**2.5E-01**
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	1.7E-01	--	--	8.5E+00	--	--	1.7E-02	--	--	8.5E-01	--	--	**8.5E-01**
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	1.6E-01	--	1.8E+00	3.2E-01	--	9.0E+01	4.0E-02	--	1.8E-01	8.0E-02	--	9.0E+00	**8.0E-02**	--	**9.0E+00**
Hexachlorocyclopentadiene	0	--	--	1.1E+03	--	--	5.5E+04	--	--	1.1E+02	--	--	5.5E+03	--	--	**5.5E+03**
Hexachloroethane [C]	0	--	--	3.3E+01	--	--	1.7E+03	--	--	3.3E+00	--	--	1.7E+02	--	--	**1.7E+02**
Hydrogen Sulfide	0	--	2.0E+00	--	--	1.0E+02	--	--	5.0E-01	--	--	2.5E+01	--	--	**2.5E+01**	--
Indeno (1,2,3-cd) pyrene C	0	--	--	1.8E-01	--	--	9.0E+00	--	--	1.8E-02	--	--	9.0E-01	--	--	**9.0E-01**
Isophorone [C]	0	--	--	9.6E+03	--	--	4.8E+05	--	--	9.6E+02	--	--	4.8E+04	--	--	**4.8E+04**
Kepone	0	--	0.0E+00	--	--	0.0E+00	--	--	0.0E+00	--	--	0.0E+00	--	--	**0.0E+00**	--
Lead	0	3.7E+01	2.9E+00	--	7.3E+01	1.4E+02	--	9.1E+00	7.2E-01	--	1.8E+01	3.6E+01	--	**1.8E+01**	**3.6E+01**	--
Malathion	0	--	1.0E-01	--	--	5.0E+00	--	--	2.5E-02	--	--	1.3E+00	--	--	**1.3E+00**	--
Mercury	0	1.8E+00	9.4E-01	--	3.6E+00	4.7E+01	--	4.5E-01	2.4E-01	--	9.0E-01	1.2E+01	--	**9.0E-01**	**1.2E+01**	--
Methyl Bromide	0	--	--	1.5E+03	--	--	7.5E+04	--	--	1.5E+02	--	--	7.5E+03	--	--	**7.5E+03**
Methylene Chloride [C]	0	--	--	5.9E+03	--	--	3.0E+05	--	--	5.9E+02	--	--	3.0E+04	--	--	**3.0E+04**
Methoxychlor	0	--	3.0E-02	--	--	1.5E+00	--	--	7.5E-03	--	--	3.8E-01	--	--	**3.8E-01**	--
Mirex	0	--	0.0E+00	--	--	0.0E+00	--	--	0.0E+00	--	--	0.0E+00	--	--	**0.0E+00**	--
Nickel	0	7.4E+01	7.2E+00	4.6E+03	1.5E+02	3.6E+02	2.3E+05	1.9E+01	1.8E+00	4.6E+02	3.7E+01	9.0E+01	2.3E+04	**3.7E+01**	**9.0E+01**	**2.3E+04**
Nitrobenzene	0	--	--	6.9E+02	--	--	3.5E+04	--	--	6.9E+01	--	--	3.5E+03	--	--	**3.5E+03**
N-Nitrosodimethylamine [C]	0	--	--	3.0E+01	--	--	1.5E+03	--	--	3.0E+00	--	--	1.5E+02	--	--	**1.5E+02**
N-Nitrosodiphenylamine [C]	0	--	--	6.0E+01	--	--	3.0E+03	--	--	6.0E+00	--	--	3.0E+02	--	--	**3.0E+02**
N-Nitrosodi-n-propylamine [C]	0	--	--	5.1E+00	--	--	2.6E+02	--	--	5.1E-01	--	--	2.6E+01	--	--	**2.6E+01**
Nonylphenol	0	7.0E+00	1.7E+00	--	1.4E+01	8.5E+01	--	1.8E+00	4.3E-01	--	3.5E+00	2.1E+01	--	**3.5E+00**	**2.1E+01**	--
Parathion	0	6.5E-02	1.3E-02	--	1.3E-01	6.5E-01	--	1.6E-02	3.3E-03	--	3.3E-02	1.6E-01	--	**3.3E-02**	**1.6E-01**	--
PCB Total [C]	0	--	1.4E-01	6.4E-04	--	7.0E+00	3.2E-02	--	3.5E-02	6.4E-05	--	1.8E+00	3.2E-03	--	**1.8E+00**	**3.2E-03**
Pentachlorophenol [C]	0	8.6E+00	5.5E+00	3.0E+01	1.7E+01	2.8E+02	1.5E+03	2.1E+00	1.4E+00	3.0E+00	4.3E+00	6.9E+01	1.5E+02	**4.3E+00**	**6.9E+01**	**1.5E+02**

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Phenol	0	--	--	8.6E+05	--	--	4.3E+07	--	--	8.6E+04	--	--	4.3E+06	--	--	**4.3E+06**
Phosphorus (Elemental)	0	--	1.0E-01	--	--	5.0E+00	--	--	2.5E-02	--	--	1.3E+00	--	--	**1.3E+00**	--
Pyrene	0	--	--	4.0E+03	--	--	2.0E+05	--	--	4.0E+02	--	--	2.0E+04	--	--	**2.0E+04**
Radionuclides	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beta and Photon Activity (mrem/yr)	0	--	--	4.0E+00	--	--	2.0E+02	--	--	4.0E-01	--	--	2.0E+01	--	--	**2.0E+01**
Selenium	0	2.0E+01	5.0E+00	4.2E+03	4.0E+01	2.5E+02	2.1E+05	5.0E+00	1.3E+00	4.2E+02	1.0E+01	6.3E+01	2.1E+04	**1.0E+01**	**6.3E+01**	**2.1E+04**
Silver	0	7.0E-01	--	--	1.4E+00	--	--	1.8E-01	--	--	3.5E-01	--	--	**3.5E-01**	--	--
1,1,2,2-Tetrachloroethane [C]	0	--	--	4.0E+01	--	--	2.0E+03	--	--	4.0E+00	--	--	2.0E+02	--	--	**2.0E+02**
Tetrachloroethylene [C]	0	--	--	3.3E+01	--	--	1.7E+03	--	--	3.3E+00	--	--	1.7E+02	--	--	**1.7E+02**
Thallium	0	--	--	4.7E-01	--	--	2.4E+01	--	--	4.7E-02	--	--	2.4E+00	--	--	**2.4E+00**
Toluene	0	--	--	6.0E+03	--	--	3.0E+05	--	--	6.0E+02	--	--	3.0E+04	--	--	**3.0E+04**
Toxaphene [C]	0	2.1E-01	2.0E-04	2.8E-03	4.2E-01	1.0E-02	1.4E-01	5.3E-02	5.0E-05	2.8E-04	1.1E-01	2.5E-03	1.4E-02	**1.1E-01**	**2.5E-03**	**1.4E-02**
Tributyltin	0	4.2E-01	7.4E-03	--	8.4E-01	3.7E-01	--	1.1E-01	1.9E-03	--	2.1E-01	9.3E-02	--	**2.1E-01**	**9.3E-02**	--
1,2,4-Trichlorobenzene	0	--	--	7.0E+01	--	--	3.5E+03	--	--	7.0E+00	--	--	3.5E+02	--	--	**3.5E+02**
1,1,2-Trichloroethane [C]		--	--	1.6E+02	--	--	8.0E+03	--	--	1.6E+01	--	--	8.0E+02	--	--	**8.0E+02**
Trichloroethylene [C]	0	--	--	3.0E+02	--	--	1.5E+04	--	--	3.0E+01	--	--	1.5E+03	--	--	**1.5E+03**
2,4,6-Trichlorophenol [C]	0	--	--	2.4E+01	--	--	1.2E+03	--	--	2.4E+00	--	--	1.2E+02	--	--	**1.2E+02**
Vinyl Chloride [C]	0	--	--	2.4E+01	--	--	1.2E+03	--	--	2.4E+00	--	--	1.2E+02	--	--	**1.2E+02**
Zinc	0	5.3E+01	4.2E+01	2.6E+04	1.1E+02	2.1E+03	1.3E+06	1.3E+01	1.1E+01	2.6E+03	2.7E+01	5.3E+02	1.3E+05	**2.7E+01**	**5.3E+02**	**1.3E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. For transition zone waters, spreadsheet prints the lesser of the freshwater and saltwater water quality criteria.
6. Regular WLA = (WQC x WLA multiplier) - (WLA multiplier - 1)(background conc.)
7. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
8. Antideg. WLA = (Antideg. Baseline)(WLA multiplier) - (WLA multiplier - 1)(background conc.)

Metal	Site Specific Target Value (SSTV)
Antimony	3.2E+03
Arsenic III	1.4E+01
Cadmium	2.8E-01
Chromium III	5.3E+01
Chromium VI	3.2E+00
Copper	1.1E+00
Lead	7.3E+00
Mercury	3.6E-01
Nickel	1.5E+01
Selenium	4.0E+00
Silver	1.4E-01
Zinc	1.1E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

March 2010
MEMORANDUM

TO: Virginia Institute of Marine Science (VIMS) Model for the Tidal Rappahannock File

FROM: Alison Thompson, Water Permitting -- NRO

SUBJECT: Virginia Institute of Marine Science Model for the Tidal Rappahannock. Input Assumptions and Summaries through December 2009

This memo summarizes all of the VIMS model inputs, assumptions, and results made to date, documenting the use of and decisions reached with the model.

The last major update to the inputs to the model was dated January 2005. It was the model run for the expansion of the Little Falls Run STP from 8.0 MGD to 13.0 MGD. In addition, staff made changes to the VIMS point source inputs due to the regulatory initiatives regarding nutrient loadings to the Chesapeake Bay. This analysis accounted for the status of the nutrient regulations in January 2005. In August 2006, staff did a correction to the model for the Fredericksburg STP flow used for the nutrient loadings. The most recent work, and the basis for this memorandum, was done because DEQ received a modification request from Spotsylvania County to move 1.4 MGD flow from FMC to the Massaponax STP.

Background

Stafford County, Spotsylvania County, and the City of Fredericksburg funded a water quality model for the upper Rappahannock River estuary developed by the Virginia Institute of Marine Science (VIMS), entitled A Modeling Study of the Water Quality of the Upper Rappahannock River (VIMS Model). This model was approved by the State Water Control Board Director on December 6, 1991. This model is used to determine effluent limitations for new and expanded discharge requests in the upper Rappahannock River, from the fall line at Fredericksburg to the Rt. 301 Bridge in King George County. VIMS documentation of the model is contained in *A Modeling Study of the Water Quality of the Upper Rappahannock River*, October 1991. A copy of the report as well as the program and general correspondence is contained in the Department of Environmental Quality (DEQ) Northern Regional Office (NRO) Rappahannock Model File.

There are 32 river miles between the fall line and the Rt. 301 Bridge. The model divides this 32 mile segment of the river into 33 model segments (see Figure 1 for discharger locations). The following point source discharges are included in the current model run:

Segment 3:	Fredericksburg STP	VA0025127	4.5 MGD
Segment 4:	FMC WWTP	VA0068110	4.0 MGD
Segment 9:	Little Falls Run STP	VA0076392	13.0 MGD
	Massaponax STP	VA0025658	9.4 MGD
Segment 20:	Four Winds Campground	VA0060429	0.210 MGD
Segment 23:	Hopyard Farm WWTP	VA0089338	0.50 MGD
Segment 26:	Haymount STP	VA0089125	0.96 MGD

Regulations affecting the VIMS model inputs

The 2008 303(d)/305(b) Integrated Report (2008 IR) indicates that the tidal, freshwater portion of the Rappahannock River (which encompasses the entire extent of this model) is impaired for not meeting the aquatic life use due to low levels of dissolved oxygen. Specifically, an open water assessment of dissolved oxygen values during the summer season showed that the tidal, freshwater Rappahannock River (RPPTF) does not meet water quality standards. The total maximum daily load (TMDL) for this impairment is due by 2010, as part of the Chesapeake Bay wide TMDL to address excess nutrients and sediment affecting the Bay.

In addition, the 2008 IR also listed the tidal, freshwater Rappahannock River as impaired for not meeting the fish consumption use, due to elevated levels of Polychlorinated Biphenyls (PCBs) in fish tissue. The Virginia Department of Health issued a fish consumption advisory for the Rappahannock River below the fall line that limits American eel, blue catfish, carp, channel catfish, croaker, gizzard shad, and anadromous (coastal) striped bass consumption to no more than two meals per month. The affected area extends from the I-95 bridge above Fredericksburg downstream to the mouth of the river near Stingray Point, including its tributaries Hazel Run up to the I-95 bridge crossing and Claiborne Run up to the Route 1 bridge crossing. The TMDL study for this impairment is due by 2016.

Finally, the tidal, freshwater Rappahannock River, from the Route 1 bridge in Fredericksburg, downstream to the confluence with Mill Creek (near the Route 301 bridge crossing) is listed as impaired for not supporting the recreational use due to exceedances of the *E. coli* bacteria criterion. A TMDL was developed for the bacteria impairment in 2007-2008. The TMDL was approved by EPA on 05/05/2008.

As of the drafting of this memo, the preliminary 2010 303(d)/305(b) Integrated Assessment indicates that the open-water aquatic life sub-use (assessed using dissolved oxygen data) for the tidal, freshwater Rappahannock River is fully supporting. There is insufficient information to determine if the aquatic life sub-use for migratory fish spawning and nursery is being met; thus, the overall aquatic life use is also listed as having insufficient information to make an assessment.

Virginia has committed to protecting and restoring the Bay and its tributaries. Currently the Agency has developed nutrient water quality standards for the Bay and its tributaries, amended the Nutrient Policy (9 VAC 25-40-10) to govern the inclusion of technology-based, numerical nitrogen and phosphorus limits in VPDES permits, and a parallel effort updating and amending the Water Quality Management Planning (WQMP) regulation 9 VAC 25-720. The Water Quality Standards for the Bay were adopted in March 2005. The WQMP regulation includes Total Nitrogen and Total Phosphorus Wasteload Allocations for all Chesapeake Bay Program Significant Discharge List (CBP SDL) discharges.

The total phosphorous loadings based on the Nutrient Policy and/or from the WQMP for the applicable facilities are as follows:

Fredericksburg STP (4.5 MGD; 0.3 mg/L)	4,111 lb/year
FMC WWTP (5.4 MGD; 0.3 mg/L)	4,934 lb/year
Little Falls Run STP (8.0 MGD; 0.3 mg/L)	7,309 lb/year
Massaponax STP (8.0 MGD; 0.3 mg/L)	7,309 lb/year
Four Winds Campground (0.21 MGD)	640 lb/year. Not in the WQMP, but must meet 1.0 mg/L annual average
Haymount STP (0.96 MGD; 0.3 mg/L)	877 lb/year
Hopyard Farm WWTP (0.5 MGD; 0.3 mg/L)	457 lb/year

The total nitrogen loadings based on the Nutrient Policy and from the WQMP for the applicable facilities are as follows:

Fredericksburg STP (4.5 MGD; 4.0 mg/L)	54,819 lb/year
FMC WWTP (5.4 MGD; 4.0 mg/L)	65,784 lb/year
Little Falls Run STP (8.0 MGD; 4.0 mg/L)	97,458 lb/year
Massaponax STP (8.0 MGD; 4.0 mg/L)	97,458 lb/year
Four Winds Campground (0.21 MGD)	5100 lb/year. Not in the WQMP, but must meet 8.0 mg/L annual average
Haymount STP (0.96 MGD; 4.0 mg/L)	11,695 lb/year

Hopyard Farm WWTP (0.5 MGD; 4.0 mg/L) 6091 lb/year.

In addition to the nutrient initiatives, the changes to the Water Quality Standards for the Chesapeake Bay and tidal waters included criteria for dissolved oxygen, water clarity, chlorophyll a, and Designated Uses. The dissolved oxygen standard for migratory fish waters for the months of February through May is a 7-day mean of greater than of 6.0 mg/L. For the months of June through January, the minimum is 5.5 mg/L. These dissolved oxygen criteria apply to the upper tidal portion of the Rappahannock River.

RADCO 208 Plan

The Rappahannock Area Development Commission (RADCO) 208 Area Waste Treatment Management Plan was adopted in August 1977, was amended in September 1983, and was repealed in 2004. The loading allocations in it had to be maintained until the Plan was repealed. The loading allocations in the Plan were based on an old water quality model, AUTO$$, that was replaced in 1991 by the VIMS model.

The VIMS model has demonstrated that nutrients are the primary factor affecting water quality in the upper tidal Rappahannock River. Numerous runs of the model have demonstrated that cBOD is not as influential as the nutrients at the maximum permitted flows of each POTW. As such, cBOD loadings are permissible above the levels specified in the old RADCO Plan.

Model Timeline

To date the model has been run seven times, each being necessitated by a request for a flow increase or for a new discharge. The runs are as follows:

1. August 14, 1995
   - expansion of Fredericksburg STP from 3.5 to 4.5 MGD
   - addition of 0.93 MGD Haymount STP in Caroline County
2. August 22, 1996
   - addition of 0.25 MGD Hopyard Farm WWTP in King George County
3. March 17, 1997
   - flow increase and production increase at White Packing
4. April 7, 1999
   - expansion of Little Falls Run STP from 4.0 to 8.0 MGD
   - expansion of Massaponax STP from 6.0 to 8.0 MGD
5. December 1, 2000
   - expansion of FMC WWTP from 4.0 to 5.4 MGD
6. April 29, 2003
   - expansion of the proposed Hopyard Farm WWTP from 0.25 to 0.50 MGD.
7. January 26, 2005
   -remove White Packing from Segment 26 since the facility is closed
   -correction of Haymount STP flow to 0.96 (previously was 0.93)
   -addition of 1.0-MGD Greenhost – Village Farms in King George County
   -expansion of Little Falls Run STP from 8.0 to 13.0 MGD
   -incorporation of the WQMP nutrient loadings for the Significant Dischargers
8. August 2006
   - correct nutrient loadings for the City of Fredericksburg
9. December 2009
   - shift 1.4 MGD flow from FMC to Massaponax (will now be 9.4 MGD)
   - change the distribution of the nitrogen species based on the data obtained from the Discharge Monitoring Reports.

The initial run on August 14, 1995, has been considered the background condition for the river segments. The VIMS files located at DEQ-NRO contain the supporting documentation for the original model inputs and the subsequent model runs. With each successive run of the model, all parameters had been kept constant except those affected by the request necessitating the model run. The most recent model runs affected a change to the nutrient loadings for all the dischargers. In the older model runs, staff used best professional judgment to determine the distribution of the three nitrogen species: Ammonia as Nitrogen, Total Kjeldahl Nitrogen, and Oxidized Nitrogen (Nitrate+Nitrite). The January 2010 run looked at actual performance data

from the four largest facilities and found that the old assumptions were not correct. The old assumptions were Ammonia as Nitrogen (25%), Total Kjeldahl Nitrogen (25%), and Oxidized Nitrogen (50%). The actual performance data from these larger facilities is Ammonia as Nitrogen (3%), Total Kjeldahl Nitrogen (37%), and Oxidized Nitrogen (60%).

Antidegradation Analysis

With each running of the model, and/or permit action concerning this section of the Rappahannock River, an antidegradation analysis has been conducted in accordance with the water quality standards and DEQ guidance. This is a difficult task since the assessment and designation of Tier I or Tier II waters is partially subjective given the narrative criteria of the standards, water quality data are not static, and waterbody boundaries are not well defined.

Since the onset of using this model, the established model segments have been used, by default, to define river sections into individual waterbodies for the antidegradation analysis. DEQ did not suggest or contend that these model segments should be used for other water quality management purposes. It was recognized that the river from the fall line down to the Rt. 301 Bridge could have been, and perhaps should have been, considered one waterbody segment. DEQ also acknowledged that this whole segment of the Rappahannock River could have been assessed as Tier I since it is considered nutrient enriched and turbid and therefore subject to corrective plans outlined in the *1999 Tributary Strategy for the Rappahannock River and Northern Neck Coastal Basins*. However, being uncertain DEQ elected to evaluate antidegradation, as through each of the model segments were actual distinct waterbodies. This approach was conservative in terms of protecting water quality and to date did not prove to be an undo burden to any of the dischargers.

Historically, four segments were identified as Tier II through this process: segment 16, segment 20, segment 23, and segment 26. Each was identified through separate permit actions that did not initially involve the VIMS model. When a segment was analyzed as Tier II, two parameters generally were assessed, ammonia and dissolved oxygen (DO). Ammonia levels were kept below the baselines and DO was kept to no lower than 0.2 mg/L of the concentration predicted in the August 14, 1995 background model run. The VIMS memo dated April 29, 2003 contains the historical summary and table of the baselines of the Tier determinations for each of the four segments.

During the January 2005 model run analysis, the entire Rappahannock River was determined to be Tier I. The previous determination of Tier II ratings for segments 16, 20, 23, and 26 were made with adherence to guidance with little best professional judgement by staff. It has been 10 years since the initial runs of the model and staff no longer believes it appropriate to assign a tier rating for each model segment. Staff believes it is best to rate the whole segment from the fall line to the Route 301 bridge as one segment. The nutrient enrichment problems of this segment, as evident by high turbidity, warrant a Tier I rating. Staff again makes this determination for the sole purpose of assigning permit limits. And since the Tier ratings have had very little influence on the results of the model, there is no measurable consequence to this change, and there is no need to continue to assess these segments (16, 20, 23, and 26) as being different from the whole river segment.

It should be noted that the predicted concentrations of dissolved oxygen and ammonia are significantly different in this current model run than what was considered the "background" concentrations. With the new loading allocations to the significant discharges in place, the model predicts that chlorophyll concentrations will be significantly less than what prior model runs have predicted and the artificially elevated levels of dissolved oxygen (nutrients stimulate chlorophyll growth and chlorophyll photosynthesis generates dissolved oxygen) are no longer predicted. Further discussion of chlorophyll a is found in the next section.

Total Phosphorus Loading Cap (historical perspective)

All of the above facilities discharge into the tidal freshwater Rappahannock River. This section of the river was formerly designated as nutrient enriched waters. Specifically, the Tidal freshwater Rappahannock River from the fall line to Buoy 44 near Leedstown, Virginia, including all tributaries to their headwaters that enter the tidal freshwater Rappahannock River were classified as nutrient enriched waters. All dischargers into nutrient enriched waters as designated in the Water Quality Standards for Nutrient Enriched Waters that were permitted before July 1, 1988, and that discharge 1 MGD or more were subject to the Policy for Nutrient Enriched Waters. This policy required facilities to meet a monthly average Total Phosphorus limitations of 2.0 mg/L and to monitor for monthly average Total Nitrogen concentration and loading values. The application of standards to protect nutrient enriched waters within the Chesapeake Bay watershed was replaced in Virginia by the aforementioned regulatory programs governing nutrient and sediment inputs into the Bay. Thus, the nutrient enriched waters designation was removed from the Water Quality Standards.

Based on the prior VIMS model runs, the chlorophyll a levels in the upper segments of the river in the Fredericksburg area approached 100 ug/L under design conditions. It is staff's best professional judgment that high chlorophyll a concentrations and the corresponding high alga growth mask dissolved oxygen depletion due to BOD loading. The model provides a 30-day average output and it is hypothesized that the elevating effect of the chlorophyll concentrations is more significant than the

depleting effect of the BOD loadings. If the model provided daily outputs, one could see the diurnal dissolved oxygen sag and super-saturation effects in an over-enriched system. Further, the model demonstrated that chlorophyll a concentrations increased with additional phosphorus (P) loadings. If P limits for the expanding STPs were based solely on the Nutrient Policy, 2 mg/L, then chlorophyll a levels would exceed 120 ug/L in the waters around the City of Fredericksburg. To prevent further increases in chlorophyll a concentrations in this part of the river, total phosphorus loadings (mass based, kg/day) were not allowed to increase for the Fredericksburg, FMC, Massaponax, and Little Falls Run wastewater treatment plants beyond the current limits. All future requests for flow increases at these facilities required that the P mass limits remain constant at the current loading limits. Permitted phosphorus concentration limits may remain at the same level prescribed by the Nutrient Policy, 2 mg/L, since it is the total mass loading that impacts chlorophyll levels. However, as effluent flows increase, in order to meet the mass limitations, effluent concentrations had to be below the 2 mg/L limit.

The relationship of how chlorophyll photosynthesis affects dissolved oxygen levels has been explored in this model and it was worth recognizing what historical baseline/initial levels were. These values were useful in the subsequent model runs for tracking how nutrients inflated dissolved oxygen levels (nutrients stimulate chlorophyll growth and chlorophyll photosynthesis generates dissolved oxygen).

DEQ has adopted a chlorophyll a narrative standard at 9VAC25-260-185 that states, "Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in undesirable or nuisance aquatic plant life, or render tidal waters unsuitable for the propagation and growth of a balanced, indigenous population of aquatic life or otherwise result in ecologically undesirable water quality conditions such as reduced water clarity, low dissolved oxygen, food supply imbalances, proliferation of species deemed potentially harmful to aquatic life or humans or aesthetically objectionable conditions."

Summary of past model runs

In the 1995 VIMS model, the winter inputs for ammonia and organic nitrogen for all wastewater treatment plants were 14 mg/L ammonia and 14 mg/L organic nitrogen. These values represented little to no nitrification. The model indicated that there were no far field violations of the winter ammonia standards. Therefore, no winter ammonia or TKN limits were established for Fredericksburg, FMC, Massaponax, and Little Falls Run wastewater treatment plants. The acute ammonia criterion for the winter months was 12.07 mg/L. DEQ did not impose winter acute based ammonia limits on any of the treatment plants for the following reasons: the discharges are located near the fall line where tidal influences are the smallest; the net advective flow of the river dominates the tidal influence; the design flows are much smaller than the critical flows of the river; ammonia decays rather rapidly; and each of the plants were achieving varying degrees of nitrification.

During the April 7, 1999 model run, winter ammonia loading had to be lowered for Little Falls Run and Massaponax from 14 mg/L to 12 mg/L in order to meet the antidegradation baselines in segment 23 and 26. Since organic nitrogen would also decrease during the nitrification process, its input into the model was also lowered to 12 mg/L for both dischargers. During this model run, the winter ammonia loadings for FMC were also lowered to 12 mg/L to meet the antidegradation baselines of segments 16, 23, and 26. At the new flows for FMC, water quality criteria and antidegradation baselines are still protective for the summer months of May – October. Since organic nitrogen would also decrease during the nitrification process, its input into the model was also lowered to 12 mg/L for FMC. Acute based ammonia limits were imposed at the new flows for the same reasons cited above. However, since the new model inputs were lower than the acute ammonia water quality standard of 12.07 mg/L, it was certain that the acute standard was protected in the winter.

In the December 1, 2000 model run, two minor data entry problems were corrected in conjunction with the expansion of FMC to 5.4 MGD. First, in the original model documentation memorandum of August 14, 1995, the assumption was made that total effluent nitrogen levels for these types of plants would be 30 mg/L, and that it would exist in the form of organic nitrogen, ammonia, and/or inorganic nitrogen depending on the facility's ability to nitrify. This can be seen on page 1 under the section "Assumptions for nitrogen". However, the value shown for the three separate nitrogen parts add up to 32 mg/L. It was felt that this was a simple oversight at the time. Additionally, during the April 7, 1999 model run, nitrate-nitrite levels were increased to 21 mg/L and 24 mg/L for the Little Falls Run and Massaponax dischargers respectively, even though the ammonia nitrogen levels were set at 12 mg/L. Therefore, in order to maintain the original model assumptions, winter nitrate input levels were reset to 6 mg/L during this run for Little Falls Run, Massaponax, and FMC. Since the Fredericksburg inputs had not been adjusted, nor had they recently been adjusted, the original values were maintained (14 mg/L organic-N, 14 mg/L Ammonia-N, and 4 mg/L Nitrate/Nitrite). Second, the ammonia loadings for the Haymount STP were incorrectly entered as 8.61 kg/d. The correct loading was entered as 3.53 kg/d. This correction had little to no impact on the model outputs.

In the April 29, 2003, model run all numerical criteria were met and all antidegradation baselines for ammonia and DO were met except for one. In the winter run, segment 23 (Hopyard Farm) yielded a DO of 7.43 mg/L. The baseline for DO in this segment is 7.47 mg/L. In order to maintain the additional 0.04 mg/L of DO, the BOD concentrations of Hopyard Farm and the upstream dischargers would have to be significantly reduced. DEQ did not believe this reduction was warranted since the model was run based on design capacity flows for all facilities and not just for Hopyard Farm. In addition, the DO deficit for segment 23 actually improved from 0.07 mg/L to 0.04 mg/L with the increase in Hopyard Farm's flows. Therefore, changes to the effluent limits were not necessary for such a small change in DO since the model is not that sensitive or accurate.

In January 2005, the model run was conducted to include the expansion of the Little Falls Run STP, the removal of White Packing, the correction of the Haymount STP flow, and the addition of Greenhost – Village Farms because of observed nutrient concentrations in the discharge. This model run also assumed that the Nutrient Policy and the WQMP regulation were adopted. Effluent loadings for $cBOD_5$ and Dissolved Oxygen were derived by multiplying the current concentration limits by the maximum permitted flow. For the facilities that are contained in the draft WQMP regulation, nutrient loadings were derived using the flows and loadings presented in draft regulation. For Four Winds Campground, nutrient loadings were derived using a total nitrogen concentration of 8.0 mg/L and a total phosphorus concentration of 1.0 mg/L based on the draft Nutrient Policy. For Hopyard Farm WWTP, nutrient loadings were derived using a total nitrogen concentration of 4.0 mg/L and a total phosphorus concentration of 0.3 mg/L based on what was the draft WQMP. Best professional judgement and actual effluent data were used to determine the loadings for Greenhost- Village Farms. There was a small excursion of the Migratory fish spawning an nursery dissolved oxygen concentration of $\geq$6 mg/L; the excursion was 5.6 mg/L. Staff did not change the BOD limits for the dischargers but recommended increased ambient monitoring of the upper tidal Rappahannock River.

Current Model Run Summary

The model was run for the summer (May- October) period because this is the most critical time and when potential dissolved oxygen excursions have been noted during past model analyses. Historically, no problems have been noted with chlorophyll or dissolved oxygen in the winter runs. It should be noted that before the model runs could be fully analyzed and other scenarios attempted, the computer that this model runs on began to fail. The older programming (Leahy Fortran) used for the VIMS model no longer runs on the newer computers. Therefore, additional modeling cannot be performed without updating the code of the VIMS model.

Summer continues to be the critical period for the water quality of the upper tidal freshwater Rappahannock River because stream flows are typically lower and the dischargers have a greater influence on the water quality in the river, and alga growth is higher during the warmer temperatures of the summer months.

Staff ran a baseline run for the summer with Massaponax at 8 MGD; the baseline run did have the nitrogen allocations changed to reflect actual effluent characteristics, as discussed above. Model runs were also done with Massaponax at 9.4 MGD, Massaponax at 9.4 MGD and all facilities meeting the WQMP conditions, all FMC flow moved to Massaponax, and all flow from FMC and the City of Fredericksburg moved to Massaponax.

Chlorophyll a & Nutrients

When the WQMP is fully implemented, the model predicts chlorophyll a levels to drop substantially even when all the dischargers are at full capacity. The WQMP essentially reduces and places total nitrogen and total phosphorus loading caps on the significant dischargers. By removing the WWTP nutrient food sources for the algae, alga populations fall and thus, chlorophyll a levels are reduced. As noted earlier in this memorandum, staff also reallocated the nitrogen species based on the performance of the upgraded facilities. This also changed the output predictions from former analyses. It is staff's best professional judgment that moving the 1.4 MGD flow from FMC to Massaponax will not have any negative effects on the chlorophyll a and nutrient concentrations in the River.

Dissolved Oxygen

Class II tidal waters in the Chesapeake Bay and it tidal tributaries must meet dissolved oxygen concentrations as specified in 9VAC25-260-185. In the Northern Virginia area, Class II waters must meet the Migratory Fish Spawning and Nursery Designated Use from February 1 through May 31. For the remainder of the year, these tidal waters must meet the Open Water use.

Designated Use	Criteria Concentration/Duration	Temporal Application
Migratory fish spawning and nursery	7-day mean > 6 mg/L (tidal habitats with 0-0.5 ppt salinity)	February 1 – May 31
	Instantaneous minimum > 5 mg/L	
Open-water[1,2]	30-day mean > 5.5 mg/L (tidal habitats with 0-0.5 ppt salinity) 30-day mean > 5 mg/L (tidal habitats with >0.5 ppt salinity)	Year-round
	7-day mean > 4 mg/L	
	Instantaneous minimum > 3.2 mg/L at temperatures < 29°C Instantaneous minimum > 4.3 mg/L at temperatures > 29°C	
	1-day mean > 2.3 mg/L	
	Instantaneous minimum > 1.7 mg/L	

[1]See subsection aa of 9 VAC 25-260-310 for site specific seasonal open-water dissolved oxygen criteria applicable to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries.

[2]In applying this open-water instantaneous criterion to the Chesapeake Bay and its tidal tributaries where the existing water quality for dissolved oxygen exceeds an instantaneous minimum of 3.2 mg/L, that higher water quality for dissolved oxygen shall be provided antidegradation protection in accordance with section 30 subsection A.2 of the Water Quality Standards.

The model results show protection of the dissolved oxygen criteria except for the month of May in several segments. The current temporal application of the dissolved oxygen standards is different than the temporal application of the model, i.e., May is classified in the summer period. The migratory fish spawning and nursery Designated Use also looks at a 7-day mean, but the model only has a 30-day output. At this time, staff does not feel any changes are necessary to the cBOD limits for the dischargers because:

1) The excursion is very small; 5.6 mg/L is the predicted concentration in segment 13 when the Massaponax flow is at 9.4 and all facilities are at the WQMP loadings and concentrations.
2) The model is not that accurate to warrant substantial changes to the STPs to achieve such a small difference in dissolved oxygen. The accuracy of the model is questionable since it was developed over 20 years ago.
3) The model assumes May to be like July, August, and September, when in fact it is not, i.e., the water temperature is cooler and the background flows are higher.

VIMS Model

Due to the age of the model and the development and changes that have occurred in the localities, staff will also inform the localities that any additional changes to design flows will require an update to the VIMS model. Staff recommends that the following be considered when the model is updated:

1) The model currently provides only a 30-day average output. It would be useful to have the ability to generate hourly, daily or other shorter averaging periods. A more refined model will allow better understanding of the relationships between DO, chlorophyll a, BOD, and nutrients.
2) Consider land use and hydrologic changes that have occurred and the associated changes to water flow, quantity and quality dynamics, especially since the Embry Dam has been removed from the River.

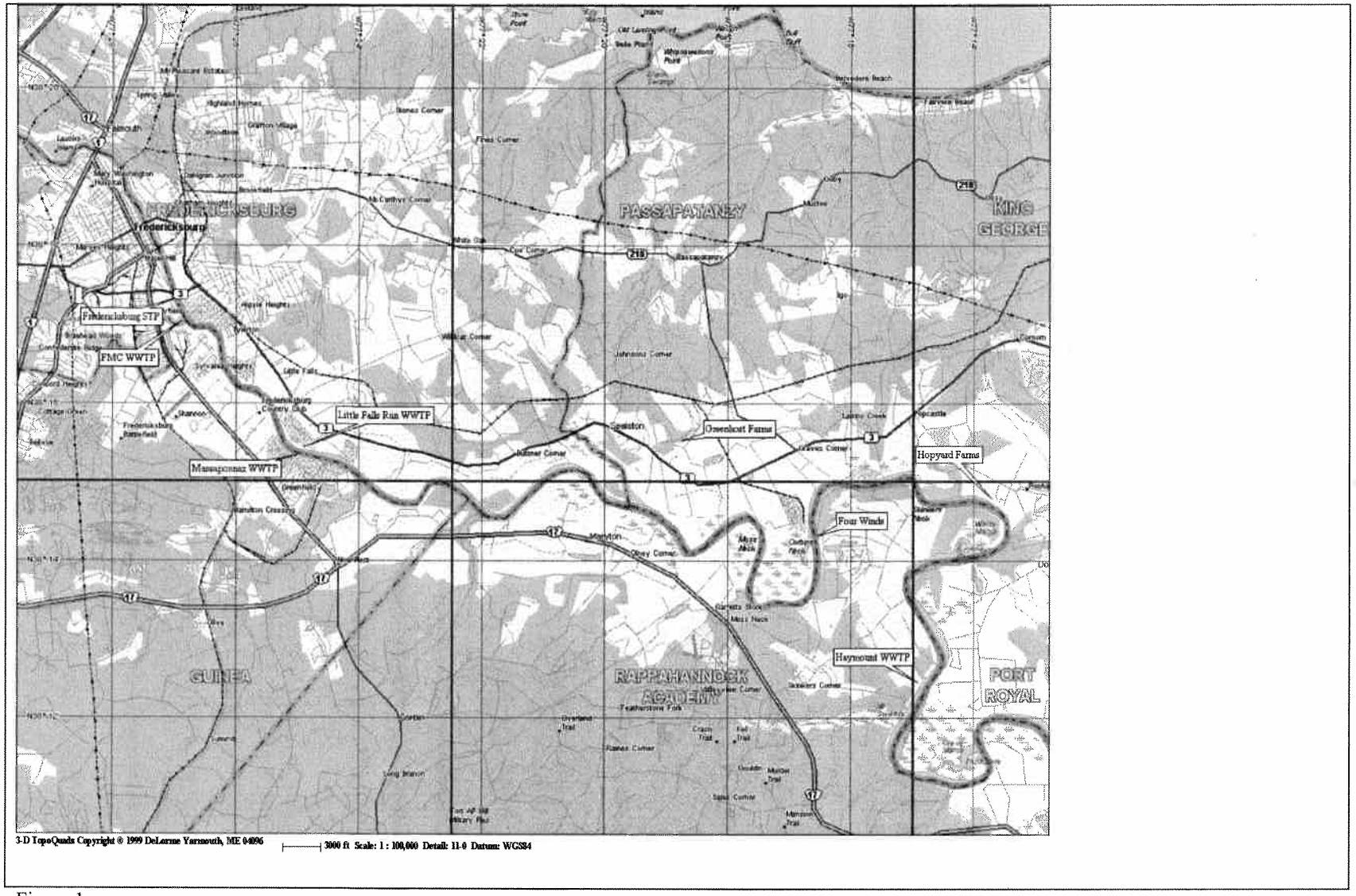


Figure 1
Discharger Locations

Table 1
Current Model Associated Limits for All Dischargers in VIMS Model

Discharger Permit No.	Fredericksburg VA0025127	FMC VA0068110	Little Falls Run VA0076392	Massaponax VA0025658	Four Winds VA0060429	Hopyard Farm VA0089338	Haymount VA0089125
Segment	3	4	9	9	20	23	26
River Mile	108.64	107.37	104.61	104.67	92.2	89.8	85.10
Flow (MGD)	4.5	5.4	13.0	9.4	0.210	0.50	0.96
BOD5 (mg/L, kg/d)	N/A	N/A	N/A	N/A	30/23.8	30/56.77	N/A
cBOD5 (mg/L, kg/d)	13.0 / 221	15.0 / 306.6	9.0 /440	10.0 / 356	N/A	N/A	10.0 / 36
TKN (summer) (mg/L, kg/d)	7.0 /119.23	3.0 / 61.3	6.0 /295	9.0 / 320	N/A	N/A	3.0 / 10.9
TKN (winter) (mg/L, kg/d)	NL	N/A	NL	NL	N/A	N/A	N/A
Ammonia (summer) (mg/L, kg/d)	N/A	N/A	4.7	N/A	2.29/1.82	10.7/20.2	N/A
Ammonia (winter) (mg/L, kg/d)	N/A	N/A	4.7	12.0 / 427	3.41/2.71	12.4/23.4	N/A
Total Phosphorous (kg/d)	26.5	30.3	30.3	45.4	1.59	3.78	7.3
Dissolved Oxygen (mg/L)	6.0	6.0	6.0	6.0	6.0	6.0	6.0

N/A – Not Applicable
NL – No Limit

3/24/2011 9:27:16 AM

Facility = Four Winds Campground @ 0.0375 MGD
Chemical = Ammonia (winter)
Chronic averaging period = 30
WLAa = 9.1
WLAc =
Q.L. = .2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 9.1
Average Weekly limit = 9.1
Average Monthly LImit = 9.1

The data are:

9

3/24/2011 9:28:24 AM

Facility = Four Winds Campground @ 0.125 & 0.210 MGD
Chemical = Ammonia (winter)
Chronic averaging period = 30
WLAa = 9.1
WLAc = 56
Q.L. = .2
# samples/mo. = 12
# samples/wk. = 3

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 9.1
Average Weekly limit = 6.65613766928719
Average Monthly LImit = 4.95795257562863

The data are:

9

3/30/2011 4:48:30 PM

Facility = Four Winds Campground @ 0.0375 MGD
Chemical = Ammonia (summer)
Chronic averaging period = 30
WLAa = 4.3
WLAc =
Q.L. = .2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 4.3
Average Weekly limit = 4.3
Average Monthly LImit = 4.3

The data are:

9

3/24/2011 9:28:58 AM

Facility = Four Winds Campground @ 0.125 & 0.210 MGD
Chemical = Ammonia (summer)
Chronic averaging period = 30
WLAa = 4.3
WLAc = 21
Q.L. = .2
# samples/mo. = 12
# samples/wk. = 3

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 4.3
Average Weekly limit = 3.14520790966318
Average Monthly LImit = 2.34276879947287

The data are:

9

MIXING ZONE CONSIDERATIONS

The above basic calculation for establishing WLA can be successfully applied to free flowing streams. However, the section of the Rappahannock River to which the Four Winds Campground STP is proposing to extend the facility's discharge (river mile 92), is tidally influenced. For tidal waters, such as estuarine embayments and tidal estuaries, different equations are used to calculate the Acute WLA (WLA_a) and the Chronic WLA (WLA_c) as follows:

$$WLA_a = 2(WQS_a)$$

$$WLA_c = 50(WQS_c)$$

Note that a dilution factor of 50 is used to calculate WLA_c in this tidal water when actual wastewater dispersion/dilution data is not available, and is only applicable to chronic impacts.

Using the calculated WQS_a and WQS_c as shown in Attachment 7, the WLA_a and the WLA_c for both Summer and Winter are:

Summer WLA_a ($WLA_{a\text{-}s}$):	16.8 mg/l as NH_3-N
Summer WLA_c ($WLA_{c\text{-}s}$):	55.0 mg/l as NH_3-N
Winter WLA_a ($WLA_{a\text{-}w}$):	25.0 mg/l as NH_3-N
Winter WLA_c ($WLA_{c\text{-}w}$):	110.0 mg/l as NH_3-N

ANTIDEGRADATION

The Board's Water Quality Standards adopted in 1992 included an antidegradation policy (VR680-21-01.3). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

Although this facility has as existing discharge, the location of the discharge is anticipated to be moved or extended from a swamp area to the Rappahannock River. The water body segment into which the facility has proposed to discharge has been determined to be Tier 2 category. This determination is based upon a review of ambient water quality monitoring data for toxics, pH and dissolved oxygen and Virginia Water Quality Assessment, 305(b) reports. According to ambient data and the 1990 and 1992 305(b) reports, the water quality parameters are better than the numerical water quality standards, and this segment meets the fishable and swimmable goals of the Clean Water Act. For waters designated as Tier 2, the existing water quality shall be maintained and protected with no significant lowering of water

quality by new or increased discharges. Although the Four Winds Campground STP is not a new facility, relocation of the outfall represents a new discharge to the Rappahannock River, which is permitted to increase from 0.0375 up to 0.210 MGD. Sufficiently stringent limits must be developed such that the change in the in-stream water quality condition resulting from the new discharge is considered insignificant and no further antidegradation review is required at this time.

Antidegradation Baselines for Ammonia

As stated above, the receiving waters have been designated as Tier 2. As such, the wasteload allocations will be calculated so that reductions in the quality of the receiving stream will be limited to no more than 25% of the difference between the existing quality (the background concentration of ammonia is zero) and the quality allowed by the standards. The corresponding instream concentration is referred to as the antidegradation baseline.

The **Summer** Acute Ammonia Baseline is: **8.4 mg/l x 0.25 = 2.1 mg/l**
The **Winter** Acute Ammonia Baseline is: **12.5 mg/l x 0.25 = 3.125 mg/l**
The **Summer** Chronic Ammonia Baseline is: **1.1 mg/l x 0.25 = 0.275 mg/l**
The **Winter** Chronic Ammonia Baseline is: **2.2 mg/l x 0.25 = 0.55 mg/l**

Antidegradation Wasteload Allocations (AWLAs)

Appling the antidegradation policy, the WLA_a and the WLA_c for both the Summer and Winter periods, will be reduced to 25 percent of the original WLA values calculated. The Antidegradation WLAs, therefore, may be calculated by substituting the antidegradation baseline values for the WQS_a and the WQS_c of corresponding season in the equations previously given to calculate the WLA_a and the WLA_c as follows:

$$AWLA_a = 2(AB_a)$$

$$AWLA_c = 50(AB_c)$$

where:
$AWLA_a$ = Antidegradation WLA_a for Summer ($AWLA_{a\text{-}s}$) or Winter ($AWLA_{a\text{-}w}$)
$AWLA_c$ = Antidegradation WLA_a for Summer ($AWLA_{c\text{-}s}$) or Winter ($AWLA_{c\text{-}w}$)
AB_a = Acute Antidegradation Baseline values for Summer ($AB_{a\text{-}s}$) or Winter ($AB_{a\text{-}w}$)
AB_c = Chronic Antidegradation Baseline values for Summer ($AB_{c\text{-}s}$) or Winter ($AB_{c\text{-}w}$)

Using the actual baseline values in these equations, the Antidegradation WLA_a and WLA_c for Summer and Winter are:

$AWLA_{a\text{-}s}$: 4.20 mg/l as NH_3-N
$AWLA_{c\text{-}s}$: 13.75 mg/l as NH_3-N
$AWLA_{a\text{-}w}$: 6.25 mg/l as NH_3-N
$AWLA_{c\text{-}w}$: 27.50 mg/l as NH_3-N

Ammonia Wasteload Allocations Comparison

The following table compares the water quality-based wasteload allocations and the antidegradation wasteload allocations. Effluent limitations for each season are based on the most limiting wasteload allocation, which for this discharge are the antidegradation WLAs.

	Water Quality-Based Wasteload Allocation (WLA)	Antidegradation Wasteload Allocation (AWLA)
Acute-Summer	16.8	4.20
Acute-Winter	25.0	6.25
Chronic-Summer	55.0	13.75
Chronic-Winter	110.0	27.50

Analysis of the Four Winds Campground STP effluent data for Ammonia
Averaging period for standard = 4 days

The statistics for Ammonia are:

Number of values	=	1
Quantification level	=	.2
Number < quantification	=	0
Expected value	=	10
Variance	=	36.00001
C.V.	=	.6
97th percentile	=	24.33418
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for Ammonia are:

Acute WLA	=	4.2
Chronic WLA	=	13.75
Human Health WLA	=	----

Limits are based on acute toxicity and 1 samples/month, 1 samples/week

Maximum daily limit	=	4.2
Average weekly limit	=	4.199999
Average monthly limit	=	4.199999

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
10

This is summer values for 0.0375 MGD

Analysis of the Four Winds Campground STP effluent data for Ammonia
Averaging period for standard = 4 days

The statistics for Ammonia are:

Number of values	=	1
Quantification level	=	.2
Number < quantification	=	0
Expected value	=	10
Variance	=	36.00001
C.V.	=	.6
97th percentile	=	24.33418
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for Ammonia are:

Acute WLA	=	4.2
Chronic WLA	=	13.75
Human Health WLA	=	----

Limits are based on acute toxicity and 12 samples/month, 3 samples/week

Maximum daily limit	=	4.2
Average weekly limit	=	3.072063
Average monthly limit	=	2.288285

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
10

This is summer values for 0.125 MGD & 0.210 MGD.

Analysis of the Four Wind- Campground STP effluent d-ta for Ammonia
Averaging period for sta rd = 4 days

The statistics for Ammonia are:

Number of values	=	1
Quantification level	=	.2
Number < quantification	=	0
Expected value	=	10
Variance	=	36.00001
C.V.	=	.6
97th percentile	=	24.33418
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for Ammonia are:

Acute WLA	=	6.25
Chronic WLA	=	27.5
Human Health WLA	=	----

Limits are based on acute toxicity and 12 samples/month, 3 samples/week

Maximum daily limit	=	6.25
Average weekly limit	=	4.571523
Average monthly limit	=	3.405187

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
10

This is winter values for 0.125 MGD and 0.210 MGD

Analysis of the Four Winds Campground STP effluent data for Ammonia
Averaging period for standard = 4 days

The statistics for Ammonia are:

Number of values	=	1
Quantification level	=	.2
Number < quantification	=	0
Expected value	=	10
Variance	=	36.00001
C.V.	=	.6
97th percentile	=	24.33418
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for Ammonia are:

Acute WLA	=	6.25
Chronic WLA	=	27.5
Human Health WLA	=	----

Limits are based on acute toxicity and 1 samples/month, 1 samples/week

Maximum daily limit	=	6.25
Average weekly limit	=	6.25
Average monthly limit	=	6.25

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
10

This is winter values for 0.0375 MGD

3/9/2011 11:01:15 AM

Facility = Four Winds Campground
Chemical = Chlorine
Chronic averaging period = 4
WLAa = 0.0095
WLAc = 0.14
Q.L. = .1
# samples/mo. = 28
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = .2
Variance = .0144
C.V. = 0.6
97th percentile daily values = .486683
97th percentile 4 day average = .332758
97th percentile 30 day average= .241210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 0.0095
Average Weekly limit = 5.80171846414427E-03
Average Monthly LImit = 4.73663509226936E-03

The data are:

0.2

		Well 1	Well 2	Well 3	Well 4	Well 5 (control)
Year	Quarter	Ammonia	Ammonia	Ammonia	Ammonia	Ammonia
2006	4th	0	0	0.1	0.105	0
2007	1st	0	0		0	0
	2nd	0	0.204		0.164	0
	3rd	6.78	6.83		0.174	3.14
	4th	0	0		0	7.28
2008	1st	0.348	0.135		0	0.902
	2nd	0.125	0.145	0.125	0.179	0.506
	3rd	0	0		0	0.533
	4th	0	0		0	0.244
2009	1st	0	0	0	0	0
	2nd	0.174	0	0	0	0
	3rd	0	0		0	0
	4th	0	0	0	0	0
2010	1st	0	0	0	0	0
	2nd	0	0	0	0	0
	3rd	0	0		0	0
	4th	0	0		0	0

Groundwater Quality Standards

Ammonia: 0.025 mg/L

Nitrate: 5 mg/L

0 = < QL

Well 3 dry if no data present

Well 1 - north of the facility at boundary with a nursery

Well 2 - east of the facility

Well 3 - near the barscreen of the facility

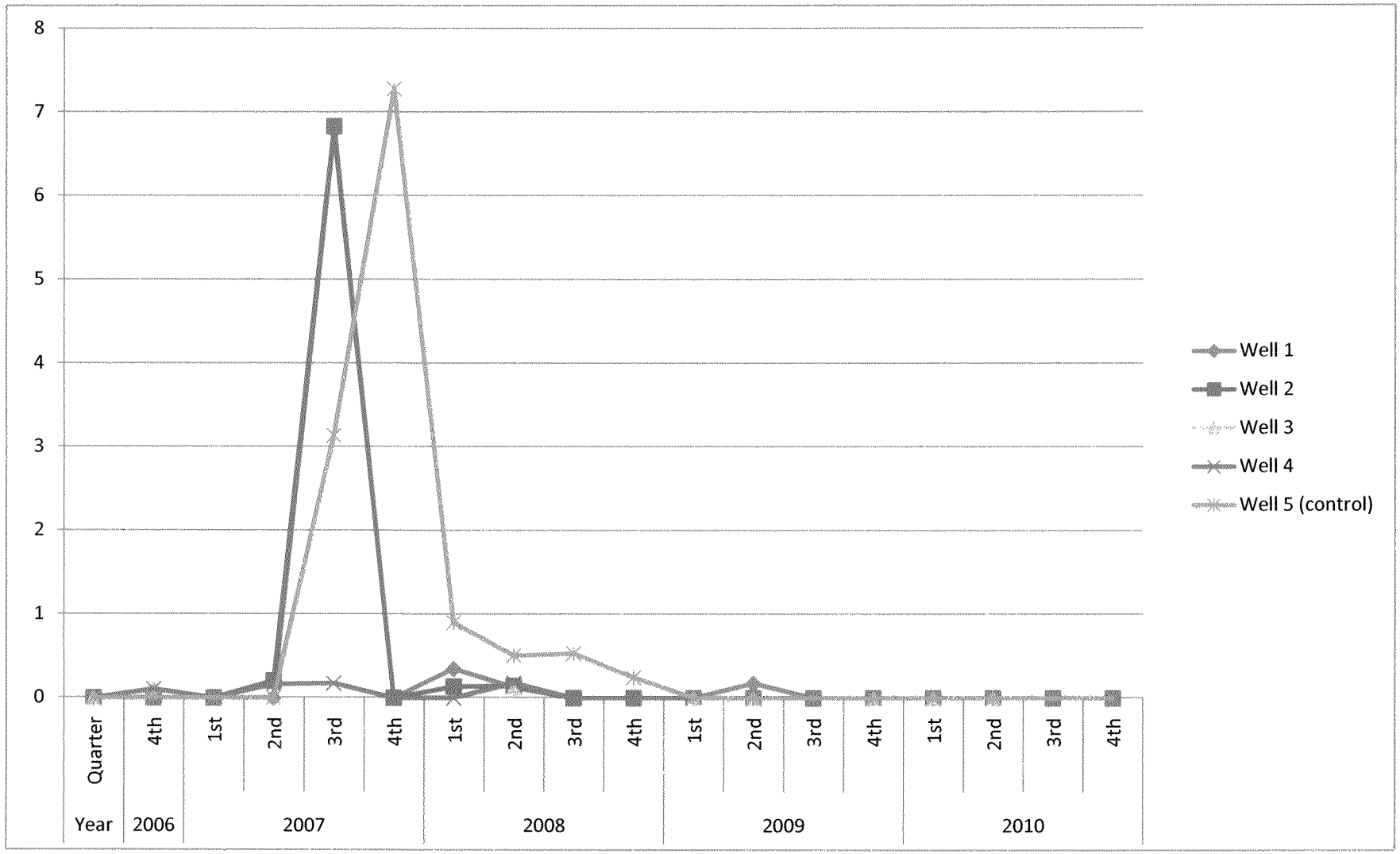
Well 4 - west of the facility

Well 5 - updradient/control, located at edge of golf course, south of plant

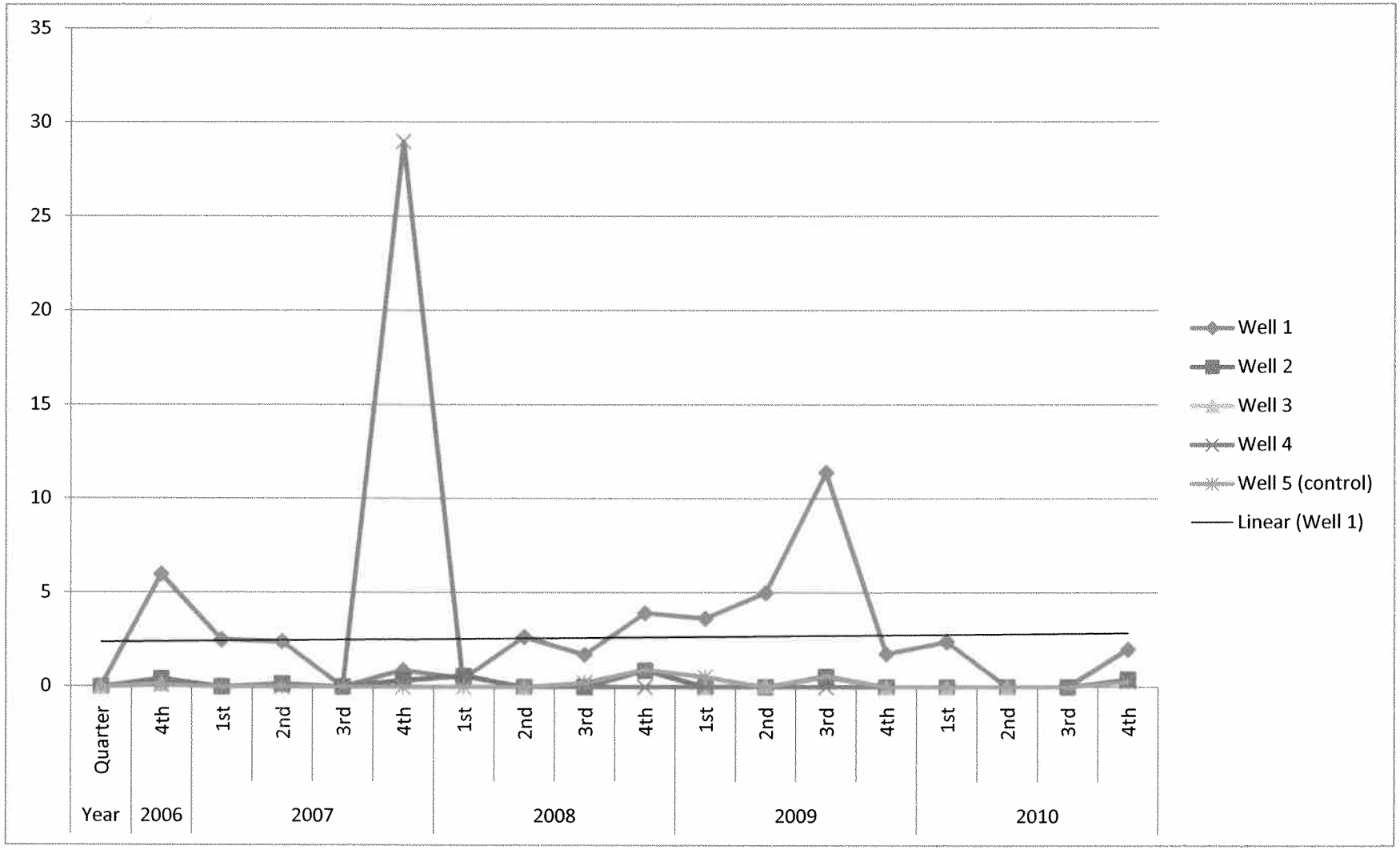
Attachment 10

		Well 1	Well 2	Well 3	Well 4	Well 5 (control)
Year	Quarter	Nitrate	Nitrate	Nitrate	Nitrate	Nitrate
2006	4th	6	0.416	0.155	0.104	0.114
2007	1st	2.5	0		0	0
	2nd	2.4	0.14		0.156	0
	3rd	0	0		0	0
	4th	0.886	0.339		29	0
2008	1st	0.438	0.585		0	0
	2nd	2.66	0	0	0	0
	3rd	1.71	0		0	0.221
	4th	3.93	0.873		0	0.913
2009	1st	3.64	0	0	0	0.537
	2nd	5	0	0.1	0	0
	3rd	11.4	0.558		0	0.59
	4th	1.75	0	0	0	0
2010	1st	2.4	0	0	0	0
	2nd	0	0	0	0	0
	3rd	0	0		0	0
	4th	2	0.4		0.3	0.3

Ammonia


8
7
6
5
4
3
2
1
0
Quarter
4th
1st
2nd
3rd
4th
1st
2nd
3rd
4th
1st
2nd
3rd
4th
1st
2nd
3rd
4th
Year
2006
2007
2008
2009
2010
Well 1
Well 2
Well 3
Well 4
Well 5 (control)

Nitrate


35
30
25
20
15
10
5
0
Quarter
Year
4th
2006
1st
2nd
3rd
4th
2007
1st
2nd
3rd
4th
2008
1st
2nd
3rd
4th
2009
1st
2nd
3rd
4th
2010
Well 1
Well 2
Well 3
Well 4
Well 5 (control)
Linear (Well 1)

Four Winds Campground
VA0060429

GROUNDWATER MONITORING REPORT

Date:_____

PARAMETER	MW1	MW2	MW3	MW4	MW5
Static Water Level (ft)					
pH (S.U.)					
Conductivity (µmhos/cm)					
Chlorides (mg/L)					
E. coli (n/100 mL)					
Nitrates (mg/L)					
Ammonia as N (mg/L)					

1. The monitoring period shall be January through March of each year starting January 2012. The DMR shall be submitted no later than the 10th of April of that same monitoring year.

2. The static water level shall be measured prior to bailing the well water for sampling. At least three volumes of groundwater shall be withdrawn immediately before sampling each well.

3. Sampling frequency shall be increased if significant contamination is detected.

Attachment 11

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Caroline County, Virginia.

PUBLIC COMMENT PERIOD: May 27, 2011 to 5:00 p.m. on June 27, 2011

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER:	Four Winds Club, Incorporated P.O. Box 7, Rappahannock Academy, VA 22538 VA0060429
NAME AND ADDRESS OF FACILITY:	Four Winds Campground STP State Route 615, Rappahannock Academy, VA 22538

PROJECT DESCRIPTION: Four Winds Club, Inc. has applied for a reissuance of a permit for the private Four Winds Campground STP. The applicant proposes to release treated sewage wastewaters from a seasonal campground, golf course and clubhouse at a rate of 0.0375 million gallons per day into a water body. This reissuance also includes expanded flow rates of 0.125 and 0.210 million gallons per day. The facility proposes to release treated sewage in the Rappahannock River in Caroline County in the Rappahannock watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, BOD, TSS, DO, Ammonia, E. coli and Chlorine.

This facility is subject to the requirements of 9 VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by email, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the documents at the DEQ-Northern Regional Office by appointment or may request electronic copies of the draft permit and fact sheet.

Name: Douglas Frasier
Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3873 email: Douglas.Frasier@deq.virginia.gov Fax: (703) 583-3821

Attachment 12

Revised 2/2003

State "Transmittal Checklist" to Assist in Targeting
Municipal and Industrial Individual NPDES Draft Permits for Review

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name:	Four Winds Campground STP
NPDES Permit Number:	VA0060429
Permit Writer Name:	Douglas Frasier
Date:	9 March 2011

Major [ ] **Minor** [X] **Industrial** [ ] **Municipal** [X]

I.A. Draft Permit Package Submittal Includes:	**Yes**	**No**	**N/A**
1. Permit Application?	X		
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?	X		
3. Copy of Public Notice?	X		
4. Complete Fact Sheet?	X		
5. A Priority Pollutant Screening to determine parameters of concern?			X
6. A Reasonable Potential analysis showing calculated WQBELs?	X		
7. Dissolved Oxygen calculations?	X		
8. Whole Effluent Toxicity Test summary and analysis?			X
9. Permit Rating Sheet for new or modified industrial facilities?			X

I.B. Permit/Facility Characteristics	**Yes**	**No**	**N/A**
1. Is this a new or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?		X	
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?	X		
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?			X
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?	X		
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?	X		
10. Does the permit authorize discharges of storm water?		X	

I.B. Permit/Facility Characteristics – cont.	Yes	No	N/A
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production?		X	
12. Are there any production-based, technology-based effluent limits in the permit?	X		
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?	X		
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?		X	
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?	X		
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?	X		
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Checklist – for POTWs
(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	**Yes**	**No**	**N/A**
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits – General Elements	**Yes**	**No**	**N/A**
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?	X		

II.C. Technology-Based Effluent Limits (POTWs)	**Yes**	**No**	**N/A**
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?	X		
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?	X		
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?			X
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?	X		
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?	X		
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?		X	
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			X

II.D. Water Quality-Based Effluent Limits	**Yes**	**No**	**N/A**
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL?			X
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?			X
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		

II.D. Water Quality-Based Effluent Limits – cont.	Yes	No	N/A
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?	X		
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?		X	
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?		X	
4. Does the permit require testing for Whole Effluent Toxicity?		X	

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?	X		
2. Does the permit include appropriate storm water program requirements?			X

II.F. Special Conditions – cont.	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			X
4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?	X		
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?		X	
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?		X	
a. Does the permit require implementation of the "Nine Minimum Controls"?			X
b. Does the permit require development and implementation of a "Long Term Control Plan"?			X
c. Does the permit require monitoring and reporting for CSO events?			X
7. Does the permit include appropriate Pretreatment Program requirements?			X

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		

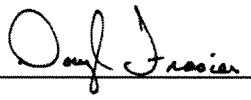
List of Standard Conditions – 40 CFR 122.41

Duty to comply	Property rights	Reporting Requirements
Duty to reapply	Duty to provide information	Planned change
Need to halt or reduce activity not a defense	Inspections and entry	Anticipated noncompliance
Duty to mitigate	Monitoring and records	Transfers
Proper O & M	Signatory requirement	Monitoring reports
Permit actions	Bypass	Compliance schedules
	Upset	24-Hour reporting
		Other non-compliance

2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?	X		

Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name	Douglas Frasier
Title	VPDES Permit Writer, Senior II
Signature	
Date	9 March 2011